

EXHIBIT A

In the Matter of:

CITY OF SPOKANE, a municipal corporation
Located in the County of Spokane,
State of Washington,
Plaintiffs

v.

MONSANTO COMPANY, SOLUTIA INC.,
and PHARMACIA CORPORATION, and
DOES 1 through 100,

Defendants.

Case No. 15-CV-00201-SMJ

Date:

November 14, 2019

Submitted by:

John H. Koon, Ph.D., P.E.

A handwritten signature in blue ink, appearing to read "John H. Koon", is centered on the page.

John H. Koon, Ph.D., P.E.

CONTENTS

1.	EXECUTIVE SUMMARY	1
2.	CONCLUSIONS	2
3.	DISCUSSION	3

APPENDICES

Appendix A Qualifications of John Koon

Appendix B References

1. EXECUTIVE SUMMARY

I have been retained by attorneys representing Defendants to provide technical expertise and conclusions in connection with the legal action captioned, City of Spokane, a municipal corporation, located in the County of Spokane, State of Washington, Plaintiff v. Monsanto Company, Solutia Inc. and Pharmacia Corporation, and Does 1 through 100, Defendants. I was asked to evaluate chemical waste disposal practices, including waste disposal recommendations generated by manufacturers of bulk industrial chemicals, including PCBs, from the 1930s to the 1970s and whether Monsanto acted appropriately in that regard. I am qualified to provide conclusions related to the above captioned case based on the following:

- I am a professional engineer in Georgia, a Board-Certified Environmental Engineer, and a Diplomate of Water Resources Engineering.
- I am a member of the National Academy of Engineering.
- I am a Professor of The Practice of Environmental Engineering at Georgia Institute of Technology (Georgia Tech).
- My education is in civil and environmental engineering with B.E. and M.S. degrees from Vanderbilt University, and a Ph.D. from the University of California-Berkeley. Environmental engineering encompasses the design of systems to dispose of wastes.
- My career has concentrated on working with manufacturing industry to manage and dispose of the chemical wastes it generates in its activities, including the techniques used for the disposal of PCBs.
- Since beginning my career in 1972, I have over 40 years' experience working with industries (and other types of waste dischargers) at over 500 sites in 18 countries regarding the proper disposal of their wastes.¹

In conducting my evaluation, I undertook several tasks related to the history of PCB use in our country, the waste disposal methods applicable to PCBs that evolved over the period of interest, and the regulatory history of PCBs in the United States. In overview, I reviewed the literature on evolving waste disposal practices and technologies during the period of interest; I reviewed Monsanto documents related to information and warnings that the company issued regarding the characteristics and disposal of PCBs; I reviewed documents related to the nature of Monsanto's PCB customers; I reviewed relevant depositions and associated exhibits; I reviewed

¹ A more detailed explanation of my qualifications is provided in Appendix A.

pertinent documents concerning waste municipal waste disposal in the Spokane watershed; and I relied upon my own experience working with the chemical industry during my career.

My conclusions are summarized in Section 2.

2. CONCLUSIONS

Disposal Instructions and Warnings

1. **Monsanto did not give customers disposal recommendations until 1970. This was appropriate for a number of reasons.** First, PCBs were a bulk industrial chemical sold by Monsanto to large, sophisticated companies that incorporated the PCBs into other products and processes. Monsanto provided those customers with information sufficient for them to make their own informed disposal decisions. That information included chemical and physical properties of PCBs (such as resistance to chemical and biological degradation, low vapor pressure, low water solubility, and their solubility in many common organic solvents), and toxicity (that PCBs could be systemically toxic at high levels – according to the Interdepartmental Task Force in 1972, there was no evidence of PCB toxicity at levels found in the environment). Second, what Monsanto did was consistent with industry standards, laws, and regulations. It was not the industry standard that bulk industrial chemical manufacturers would instruct customers on how to dispose of their products, and no laws or regulations required it. Under the legal and regulatory framework, and accepted industry standards and practice, it was the responsibility of the user of the industrial bulk product – the generator of the waste – to determine the proper method of waste disposal. The disposal of industrial chemicals was driven by known hazards (such as explosiveness, corrosiveness, flammability, acute toxicity to fish, potential damage to disposal systems, unacceptable levels of smoke, odors, and attraction of vermin and pests). What did not drive disposal practices, standards, and laws during that period was unknown risks of unmeasurable levels of chemicals in the environment.

2. **Monsanto's disposal recommendations and warnings, first issued in February 1970, were appropriate.** PCBs were first detected in the environment by Swedish scientists using newly developed, experimental analytical equipment in late 1966. The first report that PCBs might harm wildlife did not occur until late 1968 – early 1969. Within a year, Monsanto communicated with its customers concerning PCB environmental issues. In doing so, Monsanto's actions were unprecedented, and were recognized and applauded by the Environmental Defense Fund. Monsanto's letters, product bulletins, labels, Material Safety Data

Sheets, and invoices, warned its customers to be careful in the use and disposal of PCBs to prevent their entry into the environment.

3. In 1976 and 1978, the EPA promulgated detailed guidelines and regulations regarding PCB disposal which all entities were required to follow.

Landfills

- 1. It was and is appropriate to landfill PCB waste.**
- 2. The disposal of PCBs in non-TSCA landfills before 1978 did not result in the widespread presence of PCBs in groundwater or migration into water bodies.**
- 3. Spokane Area Landfills are not a source of PCBs to the Spokane River.**
- 4. Regulatory authorities (federal and state) have determined that landfills are appropriate for the disposal of PCB waste.**

Incineration

- 1. Monsanto constructed the first incinerator designed to incinerate PCBs in 1971. It was not technologically feasible to incinerate and destroy PCBs before 1971.**
- 2. Monsanto encouraged and incentivized customers to return PCBs for disposal.**
- 3. When Monsanto ceased operating its PCB incinerator, other facilities were available, and the EPA established detailed rules on safe PCB disposal.**
- 4. Monsanto disposed of all the PCB waste that its customers sent to it – over 29 million pounds.**
- 5. When Monsanto operated its PCB incinerator, effective methods of PCB solid waste incineration had not been demonstrated. PCB solid waste was appropriately disposed of in landfills.**

3. DISCUSSION

3.1 Disposal Instructions and Warnings

3.1.1. Monsanto did not give customers disposal recommendations until 1970. This was appropriate for a number of reasons.

PCBs were a bulk industrial chemical predominately sold by Monsanto to large, sophisticated companies that incorporated the PCBs into other products and processes. Approximately 85% of all PCBs manufactured by Monsanto from 1935 to 1977 were used as fire safety fluid for

electrical equipment and hydraulic and heat transfer systems.² In addition, 9.2% of sales were for plasticizer applications, most of which were industrial and many of which had fire safety uses.³

As an illustration of the sophistication of Monsanto's customers, among the most significant customers of PCB dielectric fluid were General Electric Corporation (General Electric) and Westinghouse Electric Company (Westinghouse).⁴ General Electric had a staff that included hundreds of scientists, chemists, physicians, and engineers, some of whom were Nobel Prize winners, and dozens of research laboratories.⁵ Westinghouse also had dozens of research laboratories staffed by hundreds of scientists, chemists, physicians, and engineers.⁶

Among the most significant customers of PCBs for plasticizers were Products Research Company (PRC) and National Cash Register (NCR).⁷ In the 1960s and early 1970s, PRC operated an industrial research laboratory involving the study of adhesives, coatings, sealants, and tapes based on synthetic resins and elastomers and was for many years a leading supplier of sealants and coatings to the commercial and military aviation industries as well as an important contributor to the missile and space programs.⁸ NCR also had research laboratories staffed by hundreds of biologists, chemists, engineers, physicists, mathematicians, and technicians.⁹ During World War II, NCR personnel were instrumental in developing an American

² USEPA, 1976. *PCBs in the United States Industrial Use and Environmental Distribution*. EPA 560/6-76-005. Prepared by Versar, Inc. February 25.

USEPA, 1979. *Polychlorinated Biphenyls 1929 – 1979: Final Report*. EPA 560/6-79-004. Prepared by Versar, Inc. May.

³ USEPA, 1976. *PCBs in the United States Industrial Use and Environmental Distribution*. EPA 560/6-76-005. Prepared by Versar, Inc. February 25.

USEPA, 1979. *Polychlorinated Biphenyls 1929 – 1979: Final Report*. EPA 560/6-79-004. Prepared by Versar, Inc. May.

⁴ PCB-ARCH0502393-96; PCB-ARCH0227266; PCB-ARCH0048654.

⁵ National Academy of Science - National Research Council, 1946. *Industrial Research Laboratories of the United States, Including Consulting Research Laboratories*. Bulletin of the National Research Council, Number 113, pp. 128 - 130.

National Academy of Science - National Research Council, 1960. *Industrial Research Laboratories of the United States, Eleventh Edition*. Publication 844, pp. 207 -210.

<https://www.ge.com/reports/post/74545089329/eyes-on-the-nobel-prize-ge-has-employed-2-nobel/> (Website accessed on 04/29/19)

⁶ National Academy of Science - National Research Council, 1960. *Industrial Research Laboratories of the United States, Eleventh Edition*. Publication 844, pp. 508 - 513.

⁷ PCB-ARCH0502393-96; PCB-ARCH0227266; PCB-ARCH0048654.

⁸ National Academy of Science - National Research Council, 1960. *Industrial Research Laboratories of the United States, Eleventh Edition*. Publication 844, p. 383.

PRC, 1968. **1968 Annual Report**.

⁹ National Academy of Science - National Research Council, 1960. *Industrial Research Laboratories of the United States, Eleventh Edition*. Publication 844, p. 335.

version of the code-breaking Bombe that could break the four- rotor Enigma machine.¹⁰

Monsanto provided those and its other customers with information sufficient for them to make their own informed disposal decisions. That information included chemical and physical properties of PCBs. Those chemical and physical properties included resistance to chemical and biological degradation, low vapor pressure, low water solubility, and their solubility in many common organic solvents. For example, in a 1940 bulletin on Plasticizers and Resins, Monsanto states that Aroclors were "...non- oxidizing, ... of low volatility, and non-corrosive to metals... insoluble in water.../excellent electrical properties, fire resistance and inertness."¹¹ In 1943 and 1946 Application Data Bulletins for the Aroclors, Monsanto described Aroclors as being non-flammable; insoluble in water; as having low vaporization losses; and being stable, and non-corrosive.¹² In 1961, Monsanto stated in an advertisement for Aroclors in Chemical & Engineering News, that Aroclors were "Virtually Indestructible: resist breakdown from heat and mechanical stress/resist burning/ ... /refuse to oxidize, volatilize, hydrolyze or otherwise react with highly reactive chemicals."¹³ In 1968, Monsanto stated in its Technical Bulletin for Aroclor Plasticizers that "Aroclor compounds are nonoxidizing, inert, ... of low volatility, non-corrosive to metals ... Aroclor compounds are not hydrolyzed by water and resist alkalies, acids, and corrosive chemicals... do not support combustion, insoluble in water...."¹⁴ In short, Monsanto supplied all of the information its customers needed to make their own informed disposal decisions.

In addition, Monsanto provided information on PCB toxicity, based on research by scientists at leading scientific institutions such as Harvard School of Public Health and the Kettering Institute of the University of Cincinnati.¹⁵ Those scientists concluded, based on high exposure rodent laboratory tests using several common PCB mixtures, that PCBs can be systemically toxic but can be safely manufactured and used. Beginning in 1937, Monsanto warned that PCBs can be

¹⁰ <https://www.cryptomuseum.com/crypto/bombe/index.htm> (Website accessed on 04/30/2019).

¹¹ PCB-ARCH0617319 – PCB-ARCH0617360.

¹² PCB-ARCH0616206 – PCB-ARCH0616227.

¹³ PCB-ARCH0232916 – PCB-ARCH0232917.

¹⁴ WATER_PCB-00011562 – WATER_PCB-00011613.

¹⁵ Drinker, C. K., 1938. *Report to the Monsanto Chemical Company*. September 15. MONS 048123 – MONS 048135.

Drinker, C. K., 1939. *Further Observations on the Possible Systemic Toxicity of Certain of the Chlorinated Hydrocarbons with Suggestions for Permissible Concentrations in the Air of Workrooms*. **The Journal of Industrial Hygiene and Toxicology**, vol 21, pp. 155 – 159.

Treon, J. F., Cleveland, F. P., Cappel, J. W., and Atchley, R. W., 1956. *The Toxicity of the Vapors of Aroclor 1242 and Aroclor 1254*. **Industrial Hygiene Quarterly**, June, pp. 204 – 213.

systemically toxic.¹⁶ Concerning toxicity at lower exposure levels, I note that the Interdepartmental Task Force found in 1972 that “there currently are no toxicological or ecological data available to indicate that the levels of PCBs currently known to be in the environment constitute a threat to human health”¹⁷

What Monsanto did was consistent with industry standards, laws, and regulations. It was not the industry standard that bulk industrial chemical manufacturers would instruct customers on how to dispose of its products, and no laws or regulations required it. For example, I have reviewed the Manufacturing Chemists’ Association, Inc. (MCA) L-1 Manuals: *Guide to Precautionary Labeling of Hazardous Chemicals* from the 1940s through the 1960s and the MCA Safety Guide SG-9: *Recommended Safe Practices and Procedures, Disposal Of Hazardous Wastes* from 1961, and none set forth a standard that would have recommended or required bulk manufacturers to issue disposal warnings or instructions.¹⁸

In addition, no laws or regulations required bulk industrial chemical manufacturers to provide disposal warnings or instructions. The Solid Waste Disposal Act of 1965 (SWDA), part of the amendments to the Clean Air Act, was the first federal law requiring use of environmentally sound methods to dispose of municipal, commercial and industrial wastes.¹⁹ The SWDA was amended in 1970 by the Resource Recovery Act (RRA) which included a requirement that a national system be developed for storage and disposal of hazardous wastes.²⁰ In 1976, the Toxic Substances Control Act (TSCA) was enacted to regulate chemical substances, including PCBs.²¹ Also in 1976, RCRA was enacted to provide “cradle to grave” responsibility for wastes

¹⁶ Watt, L. A., 1937. Memo, October 11. PCB-ARCH0177742.

Monsanto, 1943. *The Aroclors, Physical Properties and Suggested Applications*. **Application Data Bulletin No. P-115**. p. 11. MONS 080143.

Monsanto, 1955. *An Indirect Aroclor Heater for Unit Chemical Operations*. **Monsanto Technical Bulletin No. O-130**. MONS 076335 – MONS 076340.

Monsanto, 1960. *Aroclor Plasticizers*. **Monsanto Technical Bulletin No. PL-306**. PCB-ARCH0266982 – PCB- ARCH0267037.

¹⁷ US Department of Commerce, Interdepartmental Task Force on PCBs. 1972. *Polychlorinated Biphenyls and the Environment*. p. 3.

¹⁸ Manufacturing Chemists’ Association, Inc. (MCA), 1946, 1949, 1953, 1956, 1961, and 1970. *Guide to Precautionary Labeling of Hazardous Chemicals, Manual L-1*.

MCA, 1961. *Recommended Safe Practices and Procedures, Disposal of Hazardous Wastes*. Safety Guide SG-9.

¹⁹ <https://waste.zendesk.com/hc/en-us/articles/211677218-What-is-the-Solid-Waste-Disposal-Act-of-1965> (Website accessed 05/01/19).

Public Law 89-272, October 20, 1965.

²⁰ Public Law 91-512. October 26, 1970.

²¹ 41 FR. 14134 – 14136.

by those who generated the wastes.²² None of these laws required bulk industrial chemical manufacturers to provide disposal warnings or instructions.

The disposal of wastes, including industrial chemicals, was driven by known hazards. These hazards typically involved such properties as explosiveness; corrosiveness; flammability; acute toxicity to fish; potential damage to disposal systems; unacceptable levels of smoke, odors; and attraction of vermin and pests, none of which were associated with PCB disposal.²³ For instance, according to research by the U.S. Fish and Wildlife Service, PCBs were not toxic to fish.²⁴ In a 1969 paper, possible PCB toxicity in aquatic organisms studied in a laboratory setting, at levels greater than 1 part per billion (ppb), shortly before Monsanto issued its environmental warnings.²⁵

What did not drive disposal practices, standards, and laws during that period were unknown risks of trace levels of chemicals that could not be measured in the environment by the analytical techniques available at the time.²⁶ Plaintiffs' experts, Rosner, Markowitz, and Matson, unfairly project backwards in time knowledge of alleged human health risks of trace levels of PCBs first hypothesized long after Monsanto ceased the manufacture and sale of PCBs.²⁷

3.1.2. Monsanto's disposal recommendations and warnings, first issued in February 1970, were appropriate.

PCBs were first detected in the environment by Swedish scientists using newly developed, experimental analytical equipment in late 1966.²⁸ The first report that PCBs might harm wildlife

²² Public Law 94-580. October 21, 1976.

²³ Manufacturing Chemists' Association, Inc. (MCA), 1946, 1949, 1953, 1956, 1961, and 1970. *Guide to Precautionary Labeling of Hazardous Chemicals, Manual L-1*.
MCA, 1961. *Recommended Safe Practices and Procedures, Disposal of Hazardous Wastes*. Safety Guide SG-9.

²⁴ Wood, E. M., 1953. *The Toxicity of 3,400 Chemicals to Fish*. Hollis, E. H. and Lennon, R. E., 1954. *The Toxicity of 1,085 Chemicals to Fish*. Reprinted in USEPA document EPA560/6-87-002.
Applegate, Howell, Hall, Jr., and Smith, 1957. *Toxicity of 4,346 Chemicals to Larval Lampreys and Fishes*, U.S. Dept. of the Interior, Fish and Wildlife Service, Special Scientific Report – Fisheries No. 207, March. Reprinted in USEPA document EPA560/6-87-002.

²⁵ Duke, T. W., Lowe, J. I., and Wilson, A. J., 1970. *A Polychlorinated Biphenyl (Aroclor 1254) in the Water, Sediment, and Biota of Escambia Bay, Florida*. **Bulletin of Environmental Contamination and Technology**, 5(2): 171-180.

²⁶ Fishbein, L. 1973. **Chromatography of Environmental Hazards, Volume II, Metals, Gaseous and Industrial Pollutants**. pp. 535 – 540.

²⁷ See, e.g., Schell, J. D., Budinsky, R.A., and Wernke, M.J., 2001. *PCBs and Neurodevelopmental Effects in Michigan Children: An Evaluation of Exposure and Dose Characterization*. **Regulatory Toxicology and Pharmacology**, Vol 33, pp. 300-312.

²⁸ *Notes on the News*, **New Scientist**, p. 612. December 13, 1966.

did not occur until late 1968 – early 1969.²⁹ Within a year, Monsanto communicated with its customers concerning PCB environmental issues. In doing so, Monsanto's actions were unprecedented, and were recognized and applauded by the Environmental Defense Fund (EDF).³⁰ The EDF praised Monsanto for their efforts in response to the discovery of potential environmental impacts of PCBs, stating in part:

What impressed us most was Monsanto's attitude and finally its action to lessen the environmental degradation caused by its product. We continue to watch your PCB clean-up program to be sure that your action is as good as your word but, in the meantime, we are impressed by your sensitivity and responsibility. Indeed, in many informal conversations, we have signaled out your company as being one capable of acting in its own long-term interest and that of society rather than its short-term economic interest. We have great respect for you.

Monsanto's letters, product bulletins, labels, Material Safety Data Sheets, and invoices, warned its customers to be careful in the use and disposal of PCBs to prevent their entry into the environment. In letters dated February 9, 1970 and February 18, 1970, Monsanto provided its PCB customers with a warning letter stating that "PCBs had been discovered at some points in some marine, aquatic, and wildlife environments. ... [W]e feel that all possible care should be taken in the application, processing, and effluent disposal to prevent them becoming environmental contaminants."³¹ Monsanto followed the February 1970 warning letters, with letters in May 1970 to their customers, in which they "strongly urge[d]" their customers to ship PCB waste to Monsanto facilities for storage and ultimate disposal.³² In May 1970, Monsanto placed in their product bulletins an environmental hazard warning which stated in part:

*PCB residues in small amounts have been found in the environment and some studies have indicated that they may be harmful to certain forms of animal life. Extreme care should therefore be taken by all users of PCB- containing products to prevent any entry into the environment through spills, leakage, use, disposal, vaporization or otherwise.*³³

In August 1970, Monsanto sent out additional warning letters to its PCB customers stating that

²⁹ Risebrough, R.W.; Rieche, P.; Peakall, D. B.; Herman, S. G.; and Kirven, M. N. 1968. *Polychlorinated Biphenyls in the Global Ecosystem*. *Nature*, Vol. 220, pp. 1098–1102. December 14. (PCB ARCH0105220 – PCB-ARCH0105224).

It was later determined that Risebrough had incorrectly attributed to PCBs the eggshell thinning in predatory birds. Peakall, D.B. and Lincer J. L., 1996. *Do PCBs Cause Eggshell Thinning?* *Environmental Pollution*, Vol. 91, pp. 127-129.

³⁰ Letter from Roderick A. Cameron, EDF to Pierre Wilkins, Monsanto. Dated August 24, 1970.

³¹ MCL000005-MCL000012; MCL000094 – MCL000105

³² MCL000184–190.

³³ PCB-ARCH0298272-0298286.

they were withdrawing all PCBs used as plasticizers or modifiers from the market and would provide incentives to customers to return unused PCBs.³⁴ On September 25, 1970, Monsanto sent a letter to its dielectric fluid customers inviting them to ship all PCB waste material to Monsanto for eventual incineration and alerting them to the incinerator services offered by another company.³⁵ On October 26, 1970, Monsanto alerted its vacuum pump fluid customers as follows: “Control of waste and spills is imperative. In no case should the material be discharged directly to streams. Used Santovac I or Santovac II should be reclaimed for continuous recycle or returned to Monsanto for disposal.”³⁶

Additionally, in 1970, Monsanto provided information to Therminol FR customers stating “... measures to avoid environmental contamination through spillage, leakage or careless disposal should be observed.”³⁷ In the Therminol Conversion Bulletin from 1970, Monsanto also stated “Most recently, PCB has been identified as a potential hazard to the environment. Monsanto has accordingly elected to discontinue the manufacture and sale of Therminol FR fluids for heat transfer applications.” Additionally, in the same bulletin, Monsanto stated “Monsanto offers an incineration service for the disposal of PCB heat transfer fluids.”³⁸ Individually and collectively, these communications were more than sufficient for Monsanto’s customers to take appropriate actions on their own to prevent PCBs from entering the environment.

On April 1, 1971, Monsanto issued its Askarel Inspection and Maintenance Guide that instructed users to dispose of carbon-contaminated Askarel in such a way “where it will not contaminate a water supply.”³⁹ On October 1, 1971, Monsanto issued its Aroclor & Pyroclor Bulk Handling Manual which stated, “Pollution of the environment must be prevented by careful handling so that spillages are minimized and any that occur should be contained and collected. Do not dispose of waste Aroclor or Pyroclor into drains or sewers. Furthermore, waste Aroclor or Pyroclor should be incinerated or reclaimed and details of the service are available from Monsanto.”⁴⁰ The manual also warned against PCB waste “entering water courses and sewers.”⁴¹ On December 1, 1971, Monsanto issued its Therminol Conversion Bulletin, which stated that “Monsanto urges the user to maintain the tight system, to correct leakage promptly,

³⁴ MCL000397–398.

³⁵ MCL000611–640.

³⁶ MCL000691–696.

³⁷ PCB-ARCH0048779.

³⁸ PCB-ARCH0588885–905.

³⁹ PCB-ARCH0168693–725.

⁴⁰ PCB-ARCH0277364–388.

⁴¹ PCB-ARCH0277364–388.

and to exercise care in the handling and disposal of this and all other such products.”⁴² As for “fluid disposal,” the Bulletin stated that “Monsanto offers an incineration service for disposal of PCB heat transfer fluids. ...”⁴³ On August 1, 1973, Monsanto issued its Aroclor 1242 E1 Bulletin, which provided disposal instructions, including recommendations for incineration, and warned that “care must be exercised during such disposal and the ultimate use of Aroclor to avoid pollution, particularly of sewers and waterways.”⁴⁴ On December 1, 1973, Monsanto issued its Transformer Askarel Inspection & Maintenance Guide, which set forth detailed disposal guidelines.⁴⁵

In 1974, detailed guidelines on the disposal of PCBs were issued by the American National Standards Institute (ANSI).⁴⁶ In March 1975, Monsanto issued a revised Transformer Askarel Inspection & Maintenance Guide, specifically citing and setting forth ANSI Disposal Guidelines.⁴⁷ Considered individually and collectively, Monsanto’s communication with its customers provided sufficient information for its customers to make their own informed disposal decisions.

3.1.3. In 1976 and 1978, the EPA promulgated detailed guidelines and regulations regarding PCB disposal that all entities were required to follow.

On April 1, 1976, the United States Environmental Protection Agency (EPA) issued guidelines pertaining to the disposal of PCB-containing wastes.⁴⁸ The EPA explicitly placed the responsibility for appropriate disposal of PCBs on the generators of PCB- containing wastes from industrial facilities.⁴⁹ On February 17, 1978, the EPA promulgated detailed regulations setting forth approved methods of PCB disposal.⁵⁰ These included specifications on conditions of incineration and landfill disposal. Thereafter, all entities were required to follow those disposal regulations.

⁴² PCB-ARCH0247276-290.

⁴³ PCB-ARCH0247276-290.

⁴⁴ PCB-ARCH0163690-693; also: PCB-ARCH0036393-396, MCL02794-2960.

⁴⁵ PCB-ARCH0168665-692; also: PCB-ARCH0163708-715, PCB-ARCH0168626-633.

⁴⁶ PCB-ARCH0255676-711.

⁴⁷ PCB-ARCH0206370-397; also: PCB-ARCH0523916-943.

⁴⁸ 41 Federal Register (FR) 14134-14136.

⁴⁹ 41 FR 14134-14136.

⁵⁰ 43 FR 7150-7164.

3.2 Landfills

3.2.1. It was and is appropriate to landfill PCB waste.

The historical use of landfills to dispose of a wide variety of substances including industrial chemicals was informed by the risks of placing those substances in landfills known at the time. Those risks, discussed above, which included explosiveness, corrosiveness, flammability, acute toxicity to fish, potential damage to disposal systems, unacceptable levels of smoke, odors, and attraction of vermin and pests, did not implicate PCBs.⁵¹ In 1972, the Interdepartmental Task Force, comprised of seven agencies of the Federal Government, including the EPA, noted that PCB waste had been disposed of in landfills and stated “PCB containing material buried in soil is not expected to migrate but should remain in place.”⁵² The Task Force further stated: “It seems reasonable that by far the largest amount is present in dumps and landfills where it is thought to be more or less sequestered from the rest of the environment.”⁵³ Because of the chemical and physical properties of PCBs, including low solubility, low vapor pressure, and strong adsorption characteristics, PCBs do not easily migrate from landfills into groundwater or water bodies.

3.2.2. The disposal of PCBs in non-TSCA landfills before 1978 did not result in the widespread presence of PCBs in groundwater or migration into water bodies.

The EPA has recognized that disposal of PCBs in non-TSCA landfills generally does not result in migration to groundwater and waterbodies.

EPA has determined PCB bulk product waste can be safely disposed of in certain non-TSCA approved landfills (those that have been permitted, licensed, or registered by a State as a municipal or non-municipal non-hazardous waste landfill). EPA established this as a disposal option for PCB bulk product waste in its 1998 rulemaking for disposal of PCBs. Additionally, EPA evaluated the fate and transport of PCBs leaching from landfills into groundwater using EPA's peer reviewed Industrial Waste Management Evaluation Model (IWEM). This evaluation supports EPA's determination that PCB bulk product waste can be safely disposed of in certain non-TSCA approved landfills as it showed that

⁵¹ Manufacturing Chemists' Association, Inc. (MCA), 1946, 1949, 1953, 1956, 1961, and 1970. *Guide to Precautionary Labeling of Hazardous Chemicals, Manual L-1*.

MCA, 1961. *Recommended Safe Practices and Procedures, Disposal of Hazardous Wastes*. Safety Guide SG-9.

⁵² US Department of Commerce, Interdepartmental Task Force on PCBs. 1972. *Polychlorinated Biphenyls and the Environment*. p. 4.

⁵³ US Department of Commerce, Interdepartmental Task Force on PCBs. 1972. *Polychlorinated Biphenyls and the Environment*. p. 102.

*these wastes are unlikely to migrate into groundwater or soil.*⁵⁴

3.2.3. Spokane Area Landfills are not a source of PCBs to the Spokane River.

With respect to PCBs, in the early 1970s, prior to and during the development of initial PCB disposal regulations under TSCA, PCB-containing wastes buried in soil were not expected to migrate or be a source of surface or groundwater contamination, due to the nonvolatile and insoluble nature of PCBs.⁵⁵ It was assumed, correctly, that PCBs in landfills would be relatively immobile and if released, would migrate slowly into the environment.

Several landfills and other waste management units have been identified in the Spokane area. A summary of these units including descriptive information and information regarding any presence of PCBs identified at these units is described below. In summary, there is no evidence that any PCBs migrated from any landfill in the Spokane area watershed to the Spokane River.

Northside Landfill

The Northside Landfill,⁵⁶ located in northwestern portion of City of Spokane (approximately one-half mile northeast of the Spokane River) is a closed municipal landfill. The landfill, which began operations in the 1930s, accepted residential and light commercial wastes, including dry-cleaning sludge and grease skimmed from wastewater treatment plants. Reportedly, industrial wastes were not disposed of at the site. Historically, wastes were disposed of by placing refuse on existing grade and covering with adjacent earth, and by the trench method, in which trenches were dug and filled with refuse. A portion of the landfill was operated as an open, burning dump between the 1930s and late 1950s, and a refuse incinerator was constructed at the site in the 1940s. The landfill ceased accepting dry cleaning sludges in 1983. Sewage sludge from City of Spokane wastewater treatment plant (WWTP) was also disposed at the site between 1979 and 1983. Subsurface investigations conducted beginning in the 1980s identified chlorinated solvents, including trichloroethene (TCE) and tetrachloroethylene (PCE), and metals (e.g., iron, manganese, lead) in on-site groundwater and in off-site groundwater wells. In the Department of Ecology Site Summary for the closed Northside Landfill, there is no mention of PCBs.⁵⁷ There

⁵⁴ <https://www.epa.gov/pcbs/frequent-questions-about-polychlorinated-biphenyl-pcb-guidance-reinterpretation> (Website accessed on April 29, 2019).

40 CFR 761.62.

⁵⁵ US Department of Commerce, Interdepartmental Task Force on PCBs. 1972. *Polychlorinated Biphenyls and the Environment*.

⁵⁶ CH2M Hill. *Feasibility Study North Landfill*. Prepared for the City of Spokane, Washington. 1988.

⁵⁷ Transcript for 30(b)6 Deposition of Scott K. Windsor, September 13, 2019 ("Windsor Deposition"), page 55: lines 15-18 ("Windsor Deposition, 55: 15-18").

is also no mention of PCBs in the EPA's Record of Decision summary of groundwater contamination at the Northside Landfill and the City has no reason to dispute the EPA's findings.⁵⁸ The City has no evidence or documentation that supports that PCB migrated from the Northside Landfill offsite at any point or specifically, that PCBs migrated from the Northside Landfill to the Spokane River.⁵⁹

There is also a "Current Cell" at the Northside Landfill that is open and actively accepting waste materials. The City also has no evidence or documentation that PCBs migrated from the Current Cell landfill offsite to ground or surface water.⁶⁰ City has no evidence or documentation that PCBs that may have been disposed at the Current Cell landfill migrated to the Spokane River.⁶¹

Southside Landfill (Closed)

The Southside Landfill is located near 65th Avenue and Regal Street in Spokane. It was purchased by the City in 1960; expanded in 1976 and 1982; then closed in 1987. At the time of closure, a "plastic cap" covered with "dirt" was applied as part of closure activities.⁶² The City has no evidence, documentation, or offsite sampling that supports that PCBs migrated from the Southside Landfill ground or surface water offsite.⁶³ City has no evidence or documentation that supports that PCBs that may have been disposed of at the Southside Landfill migrated to the Spokane River at any time.⁶⁴

Mica Landfill (Closed)

The Mica Landfill, located approximately 12 miles southeast of the City of Spokane, was a municipal solid waste landfill in operation between 1972 and 1991. The landfill also received industrial wastes (e.g., pesticides, fungicides, herbicides, fertilizers, electronics industry wastes, petroleum products, degreaser solvents, paints, baghouse waste) during the 1970s.⁶⁵ In addition, black dross, a byproduct of aluminum production, was disposed at the landfill between 1974 and 1987. Waste disposal practices at the landfill resulted in the migration of several

⁵⁸ Windsor Deposition, 57: 16-25; 58: 1-8.

⁵⁹ Windsor Deposition, 58: 9-22.

⁶⁰ Windsor Deposition, 59: 21-24.

⁶¹ Windsor Deposition, 59: 25; 60: 1-4.

⁶² "The Spokesman-Review." March 25, 2013. <https://www.spokesman.com/stories/2013/mar/25/officials-seek-alternatives-to-burning-off/> (Website accessed on November 8, 2019).

⁶³ Windsor Deposition, 61: 22-25; 62: 1-5.

⁶⁴ Windsor Deposition, 62: 6-10

⁶⁵ Washington Department of Ecology. *EPA Superfund Record of Decision, Mica Landfill*, EPA ID: WAD980511661, OU 01, Mica, Washington. 2001.

contaminants, including acetone, phenols, chloroform, 1,1,1-trichloroethane (1,1,1-TCA), 1,2-dichloroethane, TCE, toluene, calcium, and zinc to off-site groundwater.⁶⁶ Monitoring conducted during the 1980s and 1990s did not identify any PCB contamination in the vicinity of the landfill.

PCBs are not listed as an “indicator substance” or “substance” in the County of Spokane’s site summary for the Mica Landfill.⁶⁷ The City has no evidence or documentation that PCBs migrated from the Mica Landfill offsite.⁶⁸ The City has no evidence or documentation that PCBs that may have been disposed of at Mica Landfill, if they were, migrated to the Spokane River at any time.⁶⁹

Marshall Landfill⁷⁰

This landfill is located approximately six miles southwest of Spokane and one mile southwest of Marshall, in Spokane County. There are two waste disposal areas on the site: a 25-acre main fill opened in 1970 and closed in 1990, and a five-acre fill opened in 1980 and closed in 1984. Contaminants found at the site included volatile organic compounds (VOCs) and metals. No mention was made of PCBs being found at the site. This landfill was privately owned and operated. Ecology reported that it was owned by Marshall Landfill, Inc.⁷¹ Ecology reported that a cleanup plan was being developed in 2018.⁷²

The “contamination” section of the Department of Ecology site summary for the Marshall Landfill does not list PCBs.⁷³ The City has no documents or evidence that any PCBs migrated offsite from the Marshall Landfill, or more specifically, migrated from the Marshall Landfill to the Spokane River.⁷⁴

⁶⁶ Washington Department of Ecology. *Potential Hazardous Waste Site Preliminary Assessment, Summary Memorandum, Mica Landfill (Spokane County), Highway 27, Mica, Washington*. 1984. *Consent Decree State of Washington Department of Ecology (Plaintiff) v. Spokane County (Defendant)*, Case No. 88-5-0005-5. 1988.

⁶⁷ Windsor Deposition, 63: 11-18.

⁶⁸ Windsor Deposition, 63: 19-23.

⁶⁹ Windsor Deposition, 64: 3-6.

⁷⁰ Windsor Deposition, Exhibit 6.

⁷¹ Washington Department of Ecology Toxics Cleanup Program, 2015. *Marshall Landfill Site*. Publication No. 15-09-023. February.

⁷² Windsor Deposition, Exhibit 6.

⁷³ Windsor Deposition, 66: 4-6.

⁷⁴ Windsor Deposition, 66: 7-15.

Spokane County Landfill (unnamed)⁷⁵

Ecology reported the existence of a landfill located just south of the Marshall landfill that was owned by Spokane County. Ecology also explained that this fill was not made part of the Marshall Landfill and associated cleanup operations because previous investigations had shown no evidence of contamination originating from this site.

Greenacres Landfill (Closed)⁷⁶

Greenacres originated as the Greenacres Township Municipal Dump and was given to Spokane County in 1967. The fill was closed in 1972, and placed on the National Priorities List (NPL), as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1984. Cleanup action was initiated in 1997 and completed in 2001. Contaminants identified at the site included VOCs, semivolatile organic compounds (SVOCs), and metals. There was no mention by Ecology of PCBs being identified at the site.

PCBs are not listed in the section entitled “Indicator Substances for Groundwater Monitoring” on the Spokane County site summary for the Greenacres Landfill.⁷⁷ The City has no documents or evidence that any PCBs migrated offsite from the Greenacres Landfill, or, more specifically, migrated from the Greenacres Landfill to the Spokane River.⁷⁸

Colbert Landfill (Closed)⁷⁹

Colbert Landfill is a Spokane County-owned 40-acre fill that received both municipal and commercial wastes from 1968 through 1986. From 1975 to 1980, the site also received organic solvents brought to the site by a local electronics manufacturing company and a variety of solvents brought to the site from Fairchild Air Force Base. No mention was made of any identification of PCBs at the site. The Record of Decision for the site describing interim final remedial actions was issued by the EPA in September 1987.

The Table in EPA Record of Decision entitled “Organic Contaminants Found in Colbert Landfill Site Groundwater During Remedial Investigation” does not identify PCBs.⁸⁰ The City has no evidence or documentation that PCBs that may have been disposed at the Colbert Landfill

⁷⁵ Washington Department of Ecology Toxics Cleanup Program, 2015. *Marshall Landfill Site*. Publication No. 15-09-023. February.

⁷⁶ Windsor Deposition, Exhibit 7.

⁷⁷ Windsor Deposition, 67: 3-16.

⁷⁸ Windsor Deposition, 67: 17-25.

⁷⁹ Windsor Deposition, Exhibit 8.

⁸⁰ Windsor Deposition, 69: 15-23.

migrated offsite, or, more specifically, that any PCBs migrated to the Spokane River.⁸¹

North County Transfer Station^{82, 83}

The North County Transfer Station is located in Colbert, WA and is owned and operated by Spokane County. It receives yard waste; food waste; trash; recyclable items; household hazardous wastes; appliances; and construction, demolition, and landscaping waste. "Waste types collected" at the transfer station, included among other wastes, transformer oils.⁸⁴ Mr. Windsor stated in his deposition that he had no knowledge that any PCBs disposed of at the site might have migrated offsite.⁸⁵ The City has no evidence or documentation that PCBs that may have been disposed at the North County Transfer Station migrated offsite, or, more specifically, that any PCBs migrated to the Spokane River.⁸⁶

Valley Transfer Station⁸⁷

The Valley Transfer Station is a Spokane County facility located on N. Sullivan Road in Spokane Valley, WA. It receives yard waste; food waste; trash; recyclable items; household hazardous wastes; appliances; and construction, demolition, and landscaping waste. "Waste types collected" at the transfer station, included among other wastes, transformer oils.⁸⁸ Mr. Windsor stated in his deposition that he had no knowledge that any PCBs disposed at the site might have migrated offsite and more specifically, that any PCBs migrated to the Spokane River.⁸⁹

Waste to Energy Facility⁹⁰

The City of Spokane operates a waste to energy plant that has a capacity of 800 tons/day (two boiler units, each operating at 400 tons/day) and processes an average of 720 tons/day of

⁸¹ Windsor Deposition, 70: 10-17.

⁸² Windsor Deposition, 70: 18ff.

⁸³ <https://spokaneriver.net/wastedirectory/vendor/north-county-transfer-station-trash-clean-green/> (Website accessed November 8, 2019).

⁸⁴ <https://spokaneriver.net/wastedirectory/vendor/north-county-transfer-station-trash-clean-green/> (Website accessed November 8, 2019).

⁸⁵ Windsor Deposition, 71: 8ff.

⁸⁶ Windsor Deposition, 71: 4-13.

⁸⁷ Windsor Deposition, 71: 14.
<https://spokaneriver.net/wastedirectory/vendor/valley-recycling-centertransfer-station/> (Website accessed November 8, 2019).

⁸⁸ <https://spokaneriver.net/wastedirectory/vendor/valley-recycling-centertransfer-station/> (Website accessed November 8, 2019).

⁸⁹ Windsor Deposition, 71: 8ff; 71: 17-25; 72: 1-2.

⁹⁰ <http://spokanewastetoenergy.com/WastetoEnergy.htm> (Website accessed November 10, 2019).

refuse. It operates 365 days/year. Operation of this facility was begun in 1991. The incinerator units operate at 2,500 degrees F. The City of Spokane has no evidence, documents, or offsite sampling that any PCBs migrated from the Waste to Energy facility to groundwater.⁹¹ The City of Spokane also has no evidence or documentation that any PCBs migrated from the Waste to Energy Facility to any point offsite the facility or specifically, that any PCBs migrated from the Waste to Energy Facility to the Spokane River.⁹²

Additionally, the Eckhardt Study⁹³ did not identify any disposal sites in the Spokane area or in Western Idaho. The City also was not aware of any other area landfills other than those identified above that the City would have deposited waste from the 1930s to the present.⁹⁴ And the City is not aware of any other “formal” landfills in the area.⁹⁵ Thus, land-based disposal sites near the Spokane River in the Spokane, WA area or upstream of Spokane are not likely to have contributed PCBs to the Spokane River.

3.2.4. Regulatory authorities (federal and state) have determined that landfills are appropriate for the disposal of PCB waste.

The EPA, as previously discussed, promulgated regulations specifically permitting disposal of PCBs in landfills. As also discussed, the EPA has expressly recognized that PCB disposal in non-TSCA landfills may be appropriate.⁹⁶ Historically, there have been no federal or state laws or regulations prohibiting the disposal of PCBs in landfills.

3.3 Incineration

3.3.1. Monsanto constructed the first incinerator designed to incinerate PCBs in 1971. It was not technologically feasible to incinerate and destroy PCBs before 1971.

Monsanto’s Incinerator

In 1970, based on pilot studies conducted in the John Zink Company pilot plant thermal oxidizer, Monsanto determined that PCBs could be destroyed via high temperature incineration.

Based on the pilot testing results, a full-scale incinerator was constructed at the Monsanto plant

⁹¹ Windsor Deposition, 52: 15-25; 53: 1-2.

⁹² Windsor Deposition, 53: 3-16.

⁹³ Committee on Interstate and Foreign Commerce, 1979. *Waste Disposal Site Survey*. October. (The “Eckhardt Study”).

⁹⁴ Windsor Deposition, 72: 17-24.

⁹⁵ Windsor Deposition, 72: 25; 73: 1-19.

⁹⁶ <https://www.epa.gov/pcbs/frequent-questions-about-polychlorinated-biphenyl-pcb-guidance-reinterpretation> (Website accessed on April 29, 2019).

40 CFR 761.62.

in Sauget, IL in 1971..⁹⁷ The incinerator design characteristics and components were as follows, as presented in Appendix B to the Federal Register Notices for “PCB-Containing Wastes (Industrial Facilities), Recommended Procedures for Disposal”:⁹⁸

1. **A liquid injection type burner.** High pressure steam was used to atomize the waste liquid for injection. The design injection rate was 1,250 lb/hr, though in practice a maximum rate of 800 lb/hr was injected due to some limitations in the design that manifested themselves after start- up. A second injector added natural gas to the combustion chamber to provide auxiliary fuel if needed to attain the set point operating temperature.
2. **A combustion chamber** configured as a 20 ft long x 9.5 ft diameter cylinder. Dwell time in the combustion chamber was 2-3 seconds..⁹⁹ Provisions were included in the design for the insertion of water, if needed, to prevent the chamber temperature from exceeding the design limit.
3. **A blower** to furnish 25% excess air into the burner and combustion chamber.
4. **A water quench column** to cool exit gas from the combustion chamber.
5. **A high energy Venturi scrubber** through which exit gas from the quench column passed for the removal of particulates which were absorbed into the liquid of the scrubber.
6. **A packed bed (filled with polypropylene packing)** through which the gas passed to remove hydrogen chloride (HCl) formed in the combustion process.
7. **A 40-ft high stack equipped with a demister** to retain water vapor contained in the gas.

The system also included four, 20,000-gallon tanks in which wastes to be incinerated were stored and retained for “several days” to permit the settling of any settleable solids contained in the waste. High alumina refractory brick was used to line the combustion chamber because of the high temperature there.

⁹⁷ Pier, A. F., 1972. *Monsanto Company, Incineration of Polychlorinated Biphenyls. Review Copy*, August 21.

MONS 0444175 - MONS 044183.

⁹⁸ 41 FR 14134-14136.

⁹⁹ Dwell time and residence time are used interchangeably to refer to the amount of time that the wastes remain in the combustion chamber.

Bench- and pilot-scale testing results and data collected from initial operation of the full-scale system indicated that PCB destruction was best above 2,000 °F. Monsanto reported that subsequent practice was to operate the incinerator in a temperature range of 2,200 – 2,400 °F.¹⁰⁰ PCB destruction in this range was reported to be 99.9998%.

Monsanto also reported a number of mechanical problems encountered in the start-up and operation of the system, including the following: rapid deterioration of refractory brick, overcome by relining the incinerator with high alumina brick; burning through the metal casing of the combustion chamber due to deterioration of the refractory in this area of the system, corrected by relining the plenum with high alumina brick; failure of the polyester lining of the scrubber column, corrected by proper preparation of the steel shell to bond to the polyester lining; deterioration of the scrubber lining in the vicinity of the flue gas inlet nozzle found to be caused by refractory brick dust in the recycle water used for Venturi scrubber water make-up, corrected by changing the source of make-up water to a source that contained no suspended matter.¹⁰¹ Monsanto concluded that the incinerator performed well, achieving high levels of PCB destruction, and other measures of performance.

Incinerators constructed prior to the late 1960s were unable to operate at temperatures capable of destroying PCBs due to technological and operational limitations. The 1974 ANSI Guidelines, the 1976 EPA Guidelines, and the 1978 TSCA regulations all recommended and required that incinerators designated to destroy PCBs operate at certain minimum temperatures, ranging from 1,100 °C to 1,200 °C (approximately 2,000 °F to 2,200 °F). In incinerators operating at temperatures from approximately 1,800 °F to 2,000 °F, slag (comprised of mineral components, metal oxides, elemental metals, and other non-combustible components) can form and adhere to the walls of the incinerator combustion chamber. This process leads to damage to the incinerator walls and refractory materials (materials able to withstand high temperatures) used to line the interiors of incinerator combustion chambers. In addition, at this time, available refractory materials were compromised and destroyed at temperatures higher than approximately 2,000 °F. Refractory materials capable of tolerating the high temperatures required to destroy PCBs were not developed until the 1960s.

¹⁰⁰ Pier, A. F., 1972. *Monsanto Company, Incineration of Polychlorinated Biphenyls. Review Copy.* August 21.

MONS 0444175 - MONS 044183.

¹⁰¹ Pier, A. F., 1972. *Monsanto Company, Incineration of Polychlorinated Biphenyls. Review Copy,* August 21.

MONS 0444175 - MONS 044183.

In addition to the fact that incinerators prior to the late 1960s could not reach temperatures sufficient to destroy PCBs, the combustion of halogenated compounds, including PCBs, polyvinyl chloride (PVC) plastics, and chlorinated solvents, results in the production of hydrochloric acid. This hydrochloric acid can corrode metal components of the incinerator and ancillary equipment (e.g., air handling equipment). To remove hydrochloric acid from incinerator exhaust gases, air pollution control equipment, such as wet scrubbers, is required. Such equipment, which is required for incinerators used to dispose of halogenated wastes, was not developed until the 1950s to 1960s.

By the mid-1970s, incineration practice had reached the level reflected in the TSCA Annex I regulations promulgated in 1979. Therefore, state-of-the-art incinerator technology, design, and operational practices changed significantly from the 1930s through 1978 (promulgation of TSCA regulations for PCB disposal) as the understanding and capabilities of incineration developed. Oppelt, in his thorough review of incineration as an available technology for the treatment of hazardous wastes,¹⁰² stated that “properly-designed incineration systems are capable of the highest overall degree of destruction and control for the broadest range of hazardous waste streams.”¹⁰³

3.3.2. Monsanto encouraged and incentivized customers to return PCBs for disposal.

Monsanto instituted a returned goods policy in May 1970.¹⁰⁴ On May 11, 1970, Monsanto sent a letter to its customers advising them that it “has been devoting considerable effort to the development of mechanisms for the disposal of these materials, including Askarel fluid, from manufacturing locations, service shops, and customers.”¹⁰⁵ Monsanto strongly urged its customers and its customers’ customers to make use of its return program for proper disposal of PCB materials.¹⁰⁶ In addition, Monsanto’s PCB returned good policy incentivized its customers to quickly return their unused PCB fluid:

¹⁰² Oppelt, E. Timothy, 1987. *Incineration of Hazardous Waste – A Critical Review*. **JAPCA**, 37(5): 558-586. May.

¹⁰³ Oppelt, E. Timothy, 1987. *Incineration of Hazardous Waste – A Critical Review*. **JAPCA**, 37(5): 558-586. May. p.558.

¹⁰⁴ Plaintiffs’ experts, Markowitz and Rosner, reference to a salesman’s memorandum, dated February 16, 1970 [PCB- ARCH0080304-305], stating that Monsanto did not want to take PCB fluids back is misleading because just months after the salesman’s memorandum was written, Monsanto sent letters to its customers encouraging them to ship PCBs back to Monsanto for disposal. See MCL000184-190.

¹⁰⁵ MCL000184-190.

¹⁰⁶ MCL000184-190.

*During this withdrawal of PCBs from the market, Monsanto has had in effect a modified returned goods policy stating that unopened containers less than one year old could be returned for full credit through July 31, 1970. From August 1 through August 31, 1970, 90 percent credit would be allowed. From September 1 through December 31, 1970, 50 percent credit would be allowed. The customer will pay all return freight. All of the dates in the time schedule for this returned goods policy are hereby extended an extra two months.*¹⁰⁷

3.3.3. When Monsanto ceased operating its PCB incinerator, other facilities were available, and the EPA established detailed rules on safe PCB disposal.

When Monsanto shut down its incinerator in late 1977, there were a number of commercial incinerators available for the disposal of PCB wastes and the final PCB disposal regulations were in the process of being finalized by EPA. In 1974, the American National Standards Institute, Inc. (ANSI) provided guidelines for the handling and disposal of PCBs (the “C107 Standard”). Available incineration sites listed in the C107 Standard included Chem-Trol Pollution Services, Inc. in Model City, NY and Rollins Environmental Services in Wilmington, Delaware, in addition to the Monsanto incinerator.¹⁰⁸ In the late 1970s, there were approximately 20 incinerators capable of handling liquid PCBs.¹⁰⁹ In an undated (presumably 1977) document, EPA states:

*Based on the latest EPA national survey of commercial hazardous waste incineration facilities, there are approximately twenty liquid waste incineration operations which will not or do not have the capability of handling solid PCB wastes. There are three installations which presently have the capability of handling both solid and liquid PCB-containing wastes and which have the presently required environmental approvals. Additionally, there are two installations which have liquid PCB incineration capability and one installation with both solid and liquid PCB waste Incineration capability which are awaiting state operating permits.*¹¹⁰

In December 1976 pursuant to TSCA Section 6(e)(1), EPA established a PCB working group to write proposed rules and regulations related to disposal and marking for PCBs. The proposed rules were to be published no later than March 31, 1977.¹¹¹ On May 24, 1977, the EPA Office of Toxic Substances published in the Federal Register, a proposed rule which prescribed

¹⁰⁷ MCL000440-461, at MCL00443.

¹⁰⁸ ANSI, 1974. *American National Standard: Guidelines for Handling and Disposal of Capacitor- and Transformer-Grade Askarels Containing Polychlorinated Biphenyls*. ANSI C107. 1-1974.

¹⁰⁹ USEPA, undated. *PCB Marking and Disposal Regulations Support Document*. p. 23.

¹¹⁰ USEPA, undated. *PCB Marking and Disposal Regulations Support Document*. p. 23.

¹¹¹ 41 FR 53692.

disposal and marking requirements for PCB's.¹¹² The informal hearings required under section 6(c)(2) and 6(e)(4) of the TSCA February 17, 1978 rule were held on June 24, 27, 28, and 29, 1977. After the public comment period expired, the final rule was promulgated on February 17, 1978.¹¹³ Therefore, at the time Monsanto decided to discontinue the operation of its PCB incinerator in 1977, detailed proposed disposal regulations had been made public [and were largely identical to those regulations that were ultimately enacted].

Additionally, on or before August 15, 1977, Monsanto notified its customers by letter that it would cease accepting PCB waste and identified alternative PCB incineration operators.¹¹⁴ In summary, at the time Monsanto decided to cease PCB incineration, other PCB incinerators were in operation, and the EPA had announced the imminent publication of detailed PCB disposal regulations which included both incineration and landfill disposal.

3.3.4. Monsanto disposed of all the PCB waste that its customers sent to it – over 29 million pounds.

Monsanto's customers returned over 29 million pounds of PCB wastes to Monsanto for disposal. From the time Monsanto started accepting PCB wastes from its customers in 1971 and the time its incinerator was shut down in December 1977, Monsanto incinerated over 27.3 million pounds of PCB wastes in its incinerator and contracted with other commercial incinerators for the incineration of approximately 1.8 million pounds of PCB wastes. As of January 1978, Monsanto had properly disposed of the over 29 million pounds of PCB wastes that it had received from its customers.¹¹⁵

3.3.5. When Monsanto operated its PCB incinerator, effective methods of PCB solid waste incineration had not been demonstrated. PCB solid waste was appropriately disposed of in landfills.

At the time Monsanto operated its PCB incinerator, there did not exist technology that was proven to effectively incinerate solid PCB waste. As the EPA noted in its 1976 PCB Disposal Guidelines, "The above recommendations are suitable for liquids. Incineration of solid wastes including PCBs has not been demonstrated."¹¹⁶

The liquid injection incinerator constructed by Monsanto was the best choice for the disposal of PCBs at that time for the following reasons:

¹¹² 42 FR 26564-26577.

¹¹³ 43 FR 7159.

¹¹⁴ MCL003102-3418.

¹¹⁵ PCB-ARCH0450243 - PCB-ARCH0450244.

¹¹⁶ 41 FR 14134-14136.

1. The largest mass of PCBs that could reasonably be collected for incineration were in liquid form.
2. The liquid injection incinerator was recognized as the best system for incineration of liquid PCBs.¹¹⁷
3. The incinerator that Monsanto planned and constructed was the first effective PCB incinerator. In using new technology, it best to use systems that can be easily brought up to design and performance capacity quickly. Liquid injection incinerators satisfied that criterion.
4. Monsanto's decision to construct the liquid injection incinerator resulted in the disposal of the greatest mass of PCBs in the shortest time.

By the time the EPA published its 1978 PCB Disposal Regulations, it had been satisfied that effective incineration of PCB solids could be accomplished.¹¹⁸

3.3.6. There is no record of incinerators near the Spokane River in Spokane, WA or upstream of Spokane that contributed PCBs to these water bodies.

With respect to municipal waste disposal, the City of Spokane has operated several municipal incinerators since 1908. Two incinerators designed by the Decarie Incinerator Company were in operation between 1908 and 1917¹¹⁹ and 1917 and early 1930s.¹²⁰ The construction of the second Decarie incinerator, located on land reclaimed from the Spokane River, incorporated several operational improvements with respect to waste receiving, cleanliness, and ancillary structures (e.g., sheds, horse stable). These incinerators were equipped with concrete stacks, each approximately 200 feet tall, to alleviate public nuisances associated with smoke/odor discharges, but the incinerators were not equipped with any air pollution control devices. Non-combustible wastes (e.g., metals) and ash were disposed of in "dumps" located adjacent to the incineration facility or along the Spokane River. During the early 1900s, the City's Crematory Department, which operated Spokane's municipal incinerators, estimated that only 20 percent of combustible wastes were collected and managed by the Department. Remaining combustible

¹¹⁷ Ackerman, D.G., and R. Scofield, 1981. *Guidelines for the Disposal of PCBs and PCB Items by Thermal Destruction*, Industrial Environmental Research Laboratory, U.S. EPA, EPA-600/S2-81-022, July.

¹¹⁸ 43 FR 7150-7164.

¹¹⁹ Peterson, Arthur E., 1913. *Waste Disposal in Spokane*. **Municipal Journal**, 34:7, pp. 239-240.

¹²⁰ Peterson, Arthur E., 1918. *Reconstruction of Spokane Incinerator*. **Municipal Journal**, 44:1, pp. 1-3.

wastes were disposed of by residents and other generators in stoves/furnaces or by open dumping in undeveloped areas.

In 1931, an upgraded municipal incinerator was constructed along the Spokane River; this incinerator incorporated operational improvements including automatic loading of refuse, improved air circulation, and drying of high moisture content wastes to facilitate incineration.¹²¹ Operating temperatures within the combustion chambers ranged from 1,250 °F to 1,800 °F. Ashes and non-combustible waste were transported to “dump” eight miles from the incineration facility. The dump is “in a location where there is so little danger of nuisance that cover is considered unnecessary.” This incinerator was replaced in 1947 by a unit equipped with a refractory lining and new stack, with design operating temperatures between 1,500 °F to 2,100 °F.

The property on which the 1931 and 1947 incinerators were located was redeveloped as a portion of the Spokane Intercollegiate Research and Technology Institute (SITRI) in the early 1990s. Ash fill material with concentrations of lead, cadmium, and mercury above applicable regulatory standards were identified at the property; no PCBs or other organic compounds were noted above regulatory criteria at the site.¹²²

Additionally, the Eckhardt Study did not identify any disposal sites in the Spokane area or in Western Idaho. Thus, incinerator sites near the Spokane River in the Spokane, WA area or upstream of Spokane are not likely to have contributed PCBs to the Spokane River.

¹²¹ *Fifteen-Year Experience Proves Efficiency of Garbage Incinerator*. **Engineering News Record**, 137:10, 124-126. 1946.

¹²² Washington Department of Ecology. Undated document. *Hazard Assessment, Spokane Intercollegiate Research and Technology Institute, Riverpoint Drive, Spokane Washington 99202*.

APPENDIX A: QUALIFICATIONS

APPENDIX A: QUALIFICATIONS

A.1 Experience of the Expert

I hold three degrees in civil and environmental engineering. My terminal degree is a Ph.D. in civil engineering (environmental engineering option) from the University of California-Berkeley. I am a licensed professional engineer (Georgia). I also have been designated a Board Certified Environmental Engineer (BCEE) by the American Academy of Environmental Engineers and a Diplomat of the Environmental and Water Resources Institute of the American Society of Civil Engineers. I am a member of the National Academy of Engineering. I am a Professor of the Practice of Environmental Engineering at the Georgia Institute of Technology (Georgia Tech). My CV appears in this Appendix, as well.

During my career of over 40 years, I, John H. Koon, have worked with industrial companies, military installations, and municipal agencies at more than 500 locations to solve environmental problems, the majority of which have involved water and wastewater issues. I provide consulting services through John H. Koon & Associates. My career has consisted predominately of work addressing complex issues in the treatment of industrial wastewaters. My experience includes projects in chemicals, pharmaceuticals, and plastics manufacturing (200 locations); electronics and electrical equipment manufacturing (7 locations); and power generation plants (several locations). Much of my experience has been with the process engineering of systems to treat and dispose of wastes, mostly wastes generated by industry. This experience includes work with incinerators and with the treatment of PCBs. These projects have included the evaluation of technologies to treat these wastes, the design of these systems, and operational evaluations of these systems. In addition to process engineering, I have experience with environmental issues related to secure landfills, Superfund sites, and other chemical disposal sites. My experience includes conducting experimental investigations with the objective of determining information needed for system design; evaluating and recommending technologies for application to the treatment of a wide variety of wastes; and participating in capital projects for which tasks of design, construction, and startup have been included.

Early in my career, I worked with an engineering company in which I played a key role in the full-scale application of new technologies required to treat industrial wastewaters to meet the recently enacted Clean Water Act. As environmental knowledge and understanding grew, practice became more refined. During the late 1960s and 1970s, I experienced the emergence of an environmental culture in the United States in which environmental legislation was enacted and regulations were promulgated to manage a wide variety of pollutants discharged to the environment. I worked with industrial clients to develop and design treatment systems to meet the initial 1977 deadline to provide treatment of their wastewaters. I experienced the change in the culture of industrial manufacturing companies as they shifted from providing minimal treatment of their discharges to the environment to greater control over the discharge of environmentally sensitive materials including the disposal of chemicals via landfilling, wastewater treatment, and incineration.

A.2 Listing of Publications I Have Authored in the Last Ten Years

A listing of publications I have authored in the last 10 years is included in my CV which appears in Appendix A. (This listing is complete according to my records and recollection, although I have not consistently cataloged my publications during all periods of my career.)

A.3 Listing of Cases in Which I Have Provided Expert Testimony in the Last Four Years

Appvion Inc., et al. v. P.H. Glatfelter Corp., et al. Case No. 08-cv-16 (E.D. Wisconsin), 2016.

San Diego Unified Port District, a public corporation; and City Of San Diego, a municipal corporation, v. Monsanto Company, Solutia Inc. and Pharmacia Corporation, and Does 1 through 100, Defendants. Case No. 3:15-CV-0578, 2019.

A.4 Compensation

I receive \$450 per hour for my work.

Attachment

Resume and publication list for Dr. John Koon



JOHN H. KOON, Ph.D., P.E., NAE

1971 BRECKENRIDGE DRIVE, NE | ATLANTA, GA 30345

B: 678.778.6763 | M: 678.778.6763

JOHNKOON@BELLSOUTH.NET

PROFILE

Dr. Koon is an environmental engineer, licensed as a Professional Engineer, and a Board Certified Environmental Engineer. In addition to his experience in the U.S. with industry, municipalities, and federal facilities, he has worked with industrial clients in Western Europe, Canada, Latin and South America, and the South Pacific. With more than 35 years of experience, his expertise lies in industrial and municipal wastewater treatment (including the treatment of groundwaters), contaminated site remediation, strategy development, technology evaluations, water quality assessment, and permitting. He has extensive experience working with capital projects delivery teams with client organizations and other engineering firms. A significant amount of his experience has involved solving environmental problems in chemically complex systems. He has been a key contributor to significant advances in the technologies used worldwide in the treatment of industrial wastewaters.

Dr. Koon began his career at AWARE, Inc. (Associated Water and Air Resources Engineers), a leading industrial environmental engineering firm during the 1970s and 1980s. Since that time Dr. Koon has played key roles in the industrial environmental practices of three other engineering organizations. For 14 years he led the industrial wastewater practice at Engineering-Science, now part of Parsons Corporation. He has worked with industrial clients at over 400 locations in the U.S.A. and abroad on projects covering a broad range of environmental problems. In addition to working with the design and operation of these facilities, he also has extensive experience working with clients and attorneys to negotiate settlements to complex problems, resolve permitting and compliance issues, and serve as expert witness.

Dr. Koon is a member of the National Academy of Engineering.

EDUCATION

B.E., Civil Engineering, 1967,
Vanderbilt University, Nashville, Tennessee

M.S., Civil and Environmental Engineering, 1969,
Vanderbilt University, Nashville, Tennessee

Ph.D., Environmental Engineering, 1971,
University of California, Berkeley, California

LICENSES AND CERTIFICATIONS

Registered Professional Engineer,
Georgia 1991 No. 1928

Board Certified Environmental Engineer,
American Academy of Environmental Engineers

Diplomate, Water Resources Engineering (D.WRE)
American Society of Civil Engineers

Envision® Sustainability Professional (ENV SP)
Institute for Sustainable Infrastructure

EXPERIENCE RECORD

2010-Present

JOHN H KOON & ASSOCIATES
PRESIDENT

Individual consulting on a variety of topics for industrial corporations and plant sites and engineering companies based on 40 years of experience in environmental engineering. This practice concentrates on providing strategic



JOHN H. KOON, Ph.D., P.E., NAE

direction to engineering projects and engineering company business direction, providing senior level support and direction to engineering departments and teams, advising clients on projects, and performing project work.

- 2010-Present **PROFESSOR OF THE PRACTICE IN ENVIRONMENTAL ENGINEERING, GEORGIA INSTITUTE OF TECHNOLOGY, ATLANTA, GA**
Teach environmental engineering design courses.
- 2005-2009 **MALCOLM PIRNIE, INC. (NOW PART OF ARCADIS)**
SENIOR CONSULTANT, VICE PRESIDENT,
NATIONAL DIRECTOR FOR INDUSTRIAL WASTEWATER MANAGEMENT
Responsible for the firm's industrial wastewater practice. Responsible for significant increases in company's industrial business on capital projects and at overseas locations.
- 1991-2005 **PARSONS**
PARSONS COMMERCIAL TECHNOLOGY GROUP; VICE PRESIDENT; DIRECTOR OF TECHNICAL AND RESOURCE MANAGEMENT. (NEW DIVISION FORMED IN 2003) (2003-2005)
Responsible for technical quality and competency of Industrial Division work products. Division's business base included providing environmental services to major industrial manufacturing corporations. At the time of formation of this unit, responsible for definition of technical procedures, work product-related policies, and technical program features; development of senior technical staff job responsibilities; and development of operating budget. Responsible for work assignments and productivity of 400 person technical staff; met productivity goal of 90+%. Also served as industrial wastewater practice leader; responsibilities included revenue production, sales support, technical quality program, and work product quality.
- PARSONS ENGINEERING-SCIENCE, VICE PRESIDENT;**
DIRECTOR OF TECHNICAL DIRECTION (1996-2002)
Led the company's Technical Direction program. Reconfigured program following company reorganization with objective of preserving company reputation while accommodating new management structure. Program included management of eight practice leaders, twenty-five Technology Leaders, the company's technical committees, and other elements of the company's technology program. Also served as practice leader for industrial water and wastewater management. Member of senior management team of the company. Significant work in pharmaceuticals, plastics, synthetic fibers, chemicals, and petroleum refining. Supported projects in South America, Mexico, Europe. Significant project experience working with industrial capital projects teams.
- ENGINEERING-SCIENCE, INC. (A PART OF PARSONS)**
Technical Manager (Practice Leader) for Industrial Water and Wastewater Management. (1991-2002)
Responsible for direction and competency of industrial water and wastewater management business; led business development (sales) for the program; provided technical direction (overview and review) on industrial wastewater and hazardous waste projects. Led three-fold increase in revenues over ten year period to \$8 million in 2001. Scope included working to achieve annual sales goal for the practice; leading the business development work of the practice across the company; client development; overseeing the development of project approaches to achieve desired results; working with industrial clients to resolve difficult and complex issues; participating in



JOHN H. KOON, Ph.D., P.E., NAE

engineering investigations, designs, and operations reviews; and reviewing projects to ensure conformance to company standards and client needs.

1984-1991

POST, BUCKLEY, SCHUH & JERNIGAN, INC. (NOW PART OF ATKINS GLOBAL)

VICE PRESIDENT - DIRECTOR OF INDUSTRIAL SERVICES (1990-1991)

Directed the firm's work with industrial clients to meet revenue targets and to insure completion of quality projects within time and budget constraints. Also responsible for the technical direction and quality control of major environmental projects.

VICE PRESIDENT - MANAGER OF INDUSTRIAL AND HAZARDOUS WASTE DIVISION (1988-1990)

Directed technical, administrative, and business development operations for all industrial wastewater and hazardous waste projects.

FOUNDING REGIONAL MANAGER - NASHVILLE OFFICE (1983-1988)

Opened office and built to a 25 person staff with diversified client base consisting of local/municipal government, industrial, and federal government clients. Responsible for business development, administrative management, financial performance, and technical direction of office. Directed project efforts to assure completion of projects within time and budget constraints. Developed and supervised projects in industrial and municipal wastewater treatment system design, contaminated site remediation, and NPDES permitting.

1983-1984

JOHN H. KOON COMPANY

PRESIDENT

Responsible for all engineering work provided by the company; provided environmental engineering services for the treatment of industrial and municipal wastewaters, hazardous waste management, and expert testimony before regulatory agencies and courts of law.

1972-1983

AWARE, INC. (NOW PART OF BROWN & CALDWELL)

VICE PRESIDENT/TECHNICAL DIRECTOR; MANAGER OF OPERATIONS DIVISION (1980-1983)

DIRECTOR OF WASTEWATER MANAGEMENT (1974-1980)

SENIOR ENGINEER (1972-1974)

Played key role in the firm's emergence as one of the nation's leading industrial environmental management firms in the 1970s. As Operations Division Manager, reorganized three divisions into one unit, implemented management structure to increase efficiency and cohesiveness of the division. Responsibilities included financial performance, business development, staffing, and technical quality of the division's work products.

SELECTED PROJECT EXPERIENCE

LITIGATION SUPPORT ASSOCIATED WITH PCB CONTAMINATION OF THE LOWER FOX RIVER, WISCONSIN.

Provided expert testimony for attorneys representing Georgia Pacific Corporation, owners of Fort Howard Paper Company, Green Bay, WI. Testimony involved evaluation of plaintiff's environmental practices at pulp and paper mills, coated paper manufacturing facilities, and ink capsule manufacturing facilities.



JOHN H. KOON, Ph.D., P.E., NAE

PROCESS DESIGN OF WASTEWATER TREATMENT FACILITIES AT A PESTICIDE MANUFACTURING FACILITY, CHINA.

Developed waste source and flow balances, wastewater characterization analyses, and process designs for treating several process waste streams from this major manufacturing facility.

REVIEW OF TECHNOLOGIES CAPABLE OF REMOVING SELENIUM FROM MINING-INFLUENCED WATERS TO LOW LEVELS, EXPERT TESTIMONY PROVIDED IN SEVERAL CASES.

Investigated selenium removal technologies applicable for the treatment of discharges from several mountain top coal mining facilities. Technologies capable of meeting the permit limits of 5 ug/L selenium were identified and evaluated to determine which were feasible for meeting the permit limits.

REVIEW OF TECHNOLOGIES FOR THE TREATMENT OF FGD WASTEWATER GENERATED AT COAL-FIRED POWER PLANTS TO ACHIEVE BEST AVAILABLE TREATMENT (BAT) LEVELS, EXPERT TESTIMONY PROVIDED IN SEVERAL CASES.

Reviewed power plant flue gas desulfurization (FGD) wastewater characteristics and identified technologies capable of achieving BAT as required by the Clean Water Act. Work involved an extensive review of existing and emerging technologies, review of information from experimental testing and application of the technologies for application to the treatment of FGD wastewaters.

REVIEW OF WASTEWATER GENERATION AND TREATMENT OPERATIONS AT A TEXTILE DYEING AND FINISHING OPERATION, EXPERT TESTIMONY PROVIDED FOR CASE INVOLVING A MAJOR FISH KILL ON THE OGEECHEE RIVER.

Reviewed industry-, Georgia EPE-, and EPA-supplied information to reveal problems with environmental management practices and water resource reclamation facility design and operation which contributed to a major fish kill immediately downstream of the industrial facility.

DESIGN OF A WASTEWATER TREATMENT AND REUSE SYSTEM FOR A MAJOR PHARMA/BIOTECH SITE, AMGEN, JUNCOS, PUERTO RICO.

The system includes equalization, neutralization, biological treatment using membrane bioreactors (MBRs), a two-stage reverse osmosis (RO) system for TDS reduction, inter-stage chemical precipitation incorporating microfiltration for scale control, and centrifuge dewatering of sludge. The MBR system was designed in the modified Ludzak-Etinger (MLE) configuration to achieve required removals of nitrogen. Work included system planning and development, modeling to project wastewater characteristics, experimental work to prove the design and establish some design parameters, design, construction assistance, operator training, and startup. 60% of the product water from the system is reused on the site.

MARATHON ASHLAND PETROLEUM: WASTEWATER TREATMENT UPGRADE / CATLETTSBURG, KY.

Developed preliminary engineering package for a wastewater treatment upgrade and relocation to resolve toxicity issues and organic removal capacity at the client's integrated refinery in Catlettsburg. A new biological treatment system, process wastewater cooling system, sludge management system, and effluent diffuser were constructed.



JOHN H. KOON, Ph.D., P.E., NAE

DEVELOPMENT OF A TOTAL WATER RECLAMATION AND REUSE SYSTEM AT A PHARMACEUTICAL MANUFACTURING SITE, WARNER-LAMBERT, INC., (NOW PIFZER), VEGA BAJA, PR.

A new wastewater treatment system was developed and designed for this pharma manufacturing plant site to meet demanding discharge limits. To take advantage of the high quality effluent produced, the Team also conducted water reuse feasibility evaluations, developed a water reuse implementation plan, and evaluated associated water chemistries. The plan was implemented. The site has reused every drop of product water for more than ten years. (Treatment system included biological nutrient removal system (BNR), GAC adsorption, reverse osmosis for TDS and metals reduction, chemical precipitation of metals in RO reject, and sludge dewatering using belt filtration.)

DEVELOPMENT OF BIOLOGICAL AND ADVANCED OXIDATION PROCESSES TO TREAT 1, 4 DIOXANE.

Following the findings that 1, 4 dioxane occurred at problematic concentrations in wastewaters and groundwaters at a number of industrial installations, Dr. Koon worked with clients to extend early research on treatment methods to design and construct biological and advanced chemical oxidation systems to reduce contaminant concentrations to required levels for discharge to the environment. Biological process developed employed moving bed bioreactor (MBBR) technology. The AOP system employed UV/peroxide technology.

DESIGN OF AN MBR UPGRADE TO AN ORGANIC CHEMICAL PLANT WASTEWATER TREATMENT SYSTEM, BOEHRINGER-INGELHEIM CHEMICALS, INC., PETERSBURG, VA.

In order to accommodate an increased waste load generated by a new production unit at the site, an existing sequencing batch reactor (SBR) system was modified to an MBR process by adding membrane units. This made it possible to accommodate a significant increase in waste load without increasing the footprint of the existing WWT system. Pilot testing was performed to investigate potential fouling problems with this particular application. Subsequently, the design was developed; the system constructed; and is now in operation and meeting expectations.

ADVISOR TO GLOBAL BIOPHARMACEUTICAL COMPANY REGARDING DISINFECTION ISSUES OF A POTW EFFLUENT, CONFIDENTIAL CLIENT, NORTHEASTERN U.S. LOCATION.

The POTW to which this site discharged its process wastewater for final treatment experienced disinfection effectiveness problems. The POTW asked the industry for assistance troubleshooting the problems and in identifying solutions. Investigations led to the identification of disinfection ineffectiveness in the presence of the buffer HEPES as the likely cause of the problems. A team of stakeholders worked to understand the problem, identify remedial measures, and develop a plan to implement these measures.

DEVELOPMENT AND IMPLEMENTATION OF A WASTEWATER MANAGEMENT STRATEGY FOR A MAJOR SYNTHETIC FIBER MANUFACTURING COMPLEX ASSOCIATED WITH EXISTING DEEP WELL DISPOSAL OF WASTES. DUPONT; VICTORIA, TEXAS.

Participated on the "Water Team" charged with developing technology to treat a high COD, high nitrate wastewater (classified as a hazardous waste) at the largest nylon Intermediates chemicals plant in the world. In addition to setting strategy for the project, work involved the conduct of extensive bench- and pilot-scale testing of treatment alternatives; identifying pretreatment criteria for individual production areas; overseeing design development.



JOHN H. KOON, Ph.D., P.E., NAE

DEVELOPMENT OF A METHOD TO REDUCE THE EXPLOSIVE CHEMICAL RDX IN AN AMMUNITION PLANT WASTEWATER, HOLSTON ARMY AMMUNITION PLANT, KINGSPORT, TN.

Faced with the need to achieve significant reductions in the discharged RDX load to the environment, the site operator commissioned work to identify, test, demonstrate, and design a process capable of achieving the new discharge limits. Bench- and pilot-scale work conducted in preparation for full-scale design. Processes evaluated included anoxic reduction, anaerobic treatment in a fluidized bed reactor, and electrolytic oxidation.

DEVELOPMENT OF RESCUE AND RECOVERY PLANS FROM ALLEGED CLEAN WATER ACT VIOLATIONS, BASF CORPORATION, LOWLAND, TN.

When this synthetic fiber plant was accused by a regulator of 24 violations of the Clean Water Act, quick and decisive action was required to respond. A plan was developed to trace and characterize all alleged illegal drains to the alleged “water of the state;” communications were established with senior regulatory representatives to whom appeals for reasonableness were made. In addition hydrologic investigations of the alleged “water of the state” were conducted to demonstrate that this “ditch” did not meet the definition of a “water of the state.” A video was made to demonstrate the salient points of the investigation. Through the implementation of remedial measures and negotiations with the state regulatory agency, all issues were resolved and the permit was renewed.

DEVELOPMENT AND NEGOTIATION OF A NEW DISCHARGE PERMIT FOR A PHARMACEUTICAL MANUFACTURING FACILITY USING “CLEAN” WATER SAMPLING TECHNIQUES, WARNER-LAMBERT, INC. (NOW PART OF PFIZER), VEGA BAJA, PR.

New discharge permit applied for and negotiated for this pharmaceutical site to govern the performance of a new WWTP on site. Work included “clean” sampling to establish metals limits, water quality modeling, preparation of technical support document, and negotiations before regulatory agencies. Application of the “clean” techniques provided data needed to negotiate significantly higher discharge limits for some constituents.

DEVELOPMENT OF AN ADSORBENT RESIN SYSTEM FOR THE REMOVAL OF SEVENTEEN PESTICIDES INTERMEDIATES AND PRODUCTS FROM A PESTICIDE MANUFACTURING PLANT WASTEWATER, VELSICOL CHEMICAL CORP., MEMPHIS, TN.

Seventeen chemicals of concern were identified in the process wastewaters from this manufacturing site. Adsorption using granular activated carbon and adsorbent resins were evaluated in experimental tests to determine the relative advantages and operating characteristics of each process. Adsorbent resins were selected for application because of the ability to regenerate the resin and effectively manage the concentrated spent regenerant on site. In order to properly conduct these tests, it was necessary to develop methods for the analysis of the seventeen chemicals of concern in the water matrix and at the concentrations needed.

EVALUATION OF A 100-MGD WASTEWATER TREATMENT FACILITY TO DETERMINE ITS OPERABILITY, U.S. EPA REGION IV.

The Morris Foreman Wastewater Treatment Plant owned and operated by the Louisville, KY Metropolitan Sewer District was shut down following repeated operational problems. EPA requested that the U.S. Army Corps of Engineers and a team led by Dr. Koon conduct a design and operational evaluation of the plant to see if it was operable and, if so, what was needed to return the plant to operating status. The evaluation was conducted, recommendations made, and the plant returned to effective operation in one month.



JOHN H. KOON, Ph.D., P.E., NAE

DEVELOPMENT OF A SYSTEM TO TREAT A HIGH NITRATE WASTEWATER FROM THE PRODUCTION OF NITROPARAFFINS, IMC CORPORATION, STERLINGTON, LA.

Bench- and pilot-scale testing was conducted to develop a biological treatment process capable of treating this wastewater. The successful configuration used what is now referred to as the modified Ludzak-Ettinger process in which incoming wastewater containing high concentrations of nitrate was combined with second stage mixed liquor in order to reduce nitrate to nitrogen gas and, simultaneously, use the nitrate oxygen to oxidize wastewater organics. Aeration was applied in a second treatment stage in order to further reduce organics (i.e., BOD/COD) to acceptable levels for discharge.

DEVELOPMENT OF TECHNIQUES TO TREAT HIGH TDS WASTEWATERS, VARIOUS INDUSTRIAL CLIENTS, WORLDWIDE LOCATIONS.

Over several years, teams on which Dr. Koon played a key role, developed methods for treating wastewaters containing TDS concentrations up to 6% or so. Experience from a number of experimental investigations and the operation of an increasing number of full-scale systems led to the identification of a threshold level beyond which effects were observed, BOD removal characteristics, expected effluent TSS concentrations, and treatment techniques which could be successfully applied. In some cases, saline bacterial cultures obtained from the vicinity of wastewater outfalls to the ocean were successfully used to treat the high saline wastewaters.

DEVELOPMENT OF A WASTEWATER SEGREGATION, ZERO DISCHARGE TREATMENT, AND WATER REUSE SYSTEM FOR AN ELEMENTAL PHOSPHORUS PLANT, HOOKER CHEMICALS, COLUMBIA, TN.

Worked with this elemental phosphorus plant in resolving significant NPDES permit problems before State of Tennessee and Region IV EPA. New permit limits were negotiated and compliance achieved. This project was conducted during the "Love Canal" era. All meetings with regulatory agencies were attended by attorneys of regulatory agencies and US Department of Justice in addition to state and DPA regulatory agency representatives. As part of the project, the Team developed, demonstrated, and designed a new process for removing elemental phosphorus from water (i.e. wastewater) that achieved a two order of magnitude lower residual concentration than previous methods.

DEVELOPMENT OF A NEW ANAEROBIC PROCESS FOR THE TREATMENT OF MUNICIPAL WASTEWATER, OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN.

Worked with an ORNL team developing this technology. Participated in strategy development and planning activities; provided oversight to bench- and pilot-scale testing; provided consultation during design phase.

TESTING AND DEVELOPMENT OF BEST AVAILABLE TREATMENT TECHNOLOGY FOR A PULP AND PAPER MILL INCLUDING A CHEMICAL REUSE COLOR REMOVAL PROCESS, GREAT SOUTHERN PAPER COMPANY (PART OF GEORGIA PACIFIC CORP.), CEDAR SPRINGS, GA.

Developed candidate BAT process trains; built and operated pilot-scale systems to evaluate two alternate systems; provided recommended recommendations for mill to anticipate upcoming regulations. Color removal employing an alum reclamation and reuse process was tested as the method for meeting anticipated color limits.

REVIEW AND CONSULTATION ON BROMIDE REMOVAL TECHNOLOGIES, BIRMINGHAM WATER AND WASTEWATER BOARD, BIRMINGHAM, AL.

Worked with the BWWB to investigate an unusually high bromide concentration in its intake water, identify the source (an upstream industrial manufacturing operation), and negotiate the selection and installation of a



JOHN H. KOON, Ph.D., P.E., NAE

treatment system to reduce bromide concentrations to acceptable levels. Bromide is a very unusual contaminant in wastewater treatment systems. This problem demanded that a relatively new technology be tested and installed by the industry to reduce bromide discharges. Ion exchange was selected by the industry, and confirmed during this review process to be a very good method of meeting the imposed limits.

DESIGN OF MODIFICATIONS AND UPGRADES FOR A WASTEWATER TREATMENT SYSTEM AT A BEVERAGE MANUFACTURING PLANT, PEPSICO, CIDRA, PR.

An existing wastewater treatment system was modified to address aging of the original system, needed capacity increases, and the imposition of more stringent discharge standards. Anaerobic/aerobic and all aerobic biological options were evaluated for BOD reduction. Color removal options including advanced oxidation using UV/peroxide, ozone, and chlorine chemistry; and chemical coagulation and powdered activated carbon were tested and evaluated for several criteria. The selected design included MBR biological treatment, color removal using chemical coagulation and powdered activated carbon addition with an advanced oxidation backup, and sludge dewatering.

DEVELOPMENT AND PROCESS ENGINEERING FOR AN ANAEROBIC/AEROBIC TREATMENT SYSTEM INCLUDING NITROGEN REMOVAL, DIXIE YEAST, INC., GASTONIA, NC.

In order to achieve required reductions in BOD and ammonia nitrogen for discharge to the POTW, a system was designed that included a first phase anaerobic treatment for BOD reduction followed by an aerobic second stage for ammonia oxidation. Work included pilot testing, process design development, negotiation of limits with POTW officials, and consulting during detailed design. The Biothane UASB process was selected for the anaerobic technology.

DEVELOPMENT OF AN INNOVATIVE PROCESS FOR A PHARMACEUTICAL MANUFACTURING FACILITY TO MINIMIZE THE COST OF EFFLUENT GUIDELINES COMPLIANCE, MERCK, BARCELONETA, PR.

Faced with the requirement to pretreat its wastewater to meet a new Effluent Guidelines requirement to significantly reduce concentrations of two EG organics, Merck agreed to select an MBBR process over conventional activated sludge treatment. The MBBR system enabled the elimination of secondary clarifiers, sludge return facilities, and the sludge dewatering and disposal system by taking advantage of high pretreatment limits for BOD and TSS. This resulted in significant cost savings for the industry while providing a system that has consistently complied with the EG limits.

INCORPORATION OF INNOVATIVE TECHNOLOGY INTO DESIGNS.

Innovative processes included in designs includes: MBBR systems – 3 designed and in operation; MBR systems – 7 designed, 2 in operation; AOP – 4 designed and in operation; nitrogen blanketed API separators and DNF (dissolved nitrogen flotation) systems – 2 designed and in operation (in petroleum refineries); reverse osmosis (RO) systems – 2 designed and in operation; microfiltration (MF) systems – 1 designed and in operation; evaporation – 3 systems designed and in operation (two mechanical and one pond system).

ADVISOR TO A MAJOR CARIBBEAN PETROLEUM REFINERY REGARDING THE DEVELOPMENT OF A STRATEGY FOR WASTEWATER TREATMENT UPGRADE, HOVENSA, ST. CROIX, VI.

The strategy addressed replacing earthen aeration basins with above-ground tanks and included an evaluation of alternative technologies for biological treatment to meet an aggressive EPA-mandated schedule. Strategy included



JOHN H. KOON, Ph.D., P.E., NAE

review of front end design package prepared by others and development of a detailed check cost estimate for the project.

DEVELOPMENT OF A TREATMENT SYSTEM TO HANDLE A HIGH COD, HIGH ORGANIC NITROGEN CONTENT WASTEWATER FROM THE PRODUCTION OF A NEW ARTIFICIAL SWEETENER; MCNEIL SPECIALTY PRODUCTS, INC. (A DIVISION OF JOHNSON & JOHNSON), MCINTOSH, AL.

Led efforts to procure NPDES permit for a greenfield chemical plant site. Developed engineering report describing WW treatment system; completed application forms; negotiated limits with state agency.

DEVELOPMENT OF A WASTEWATER TREATMENT SYSTEM FOR NISSAN MANUFACTURING CORPORATION'S SMYRNA, TENNESSEE PLANT.

DEVELOPMENT OF WASTEWATER MANAGEMENT PLANS FOR A STEEL MILL, SYDOR, PUERTO ORDAZ, VENEZUELA.

This privatized mill was required to meet applicable environmental standards as a condition of the sale to the private company. Existing facilities were inspected and the performance evaluated; new facilities were identified which would be needed to meet required discharge levels; planning level capital estimates were developed for the recommended plan.

DEVELOPMENT OF WASTEWATER TREATMENT FACILITIES FOR A NEW PULP AND PAPER MILL IN ALABAMA, PARSONS & WHITEMORE, CLAIRBORNE, AL.

Biological treatment accomplished using an oxygen activated sludge process.

TECHNICAL REVIEW AND PERMIT MODIFICATIONS FOR A PETROLEUM REFINERY, EXXON-MOBIL, JOLIET, IL.

Evaluation of a refinery wastewater treatment system to identify problems achieving nitrification of the wastewater. Subsequently, support was provided to seek permit relief from a nitrification requirement.

DEVELOPMENT OF A MOVING BED BIOREACTOR DESIGN TO UPGRADE AN EXISTING TREATMENT SYSTEM, EXXONMOBIL: BATON ROUGE, LA.

Developed a moving-bed bioreactor process (Kaldnes process) to replace existing first-stage wastewater treatment process.

DEVELOPMENT OF AN AERATED STABILIZATION WASTEWATER TREATMENT SYSTEM TO ACHIEVE NEW SOURCE PERFORMANCE STANDARDS AT A NEW PULP MILL IN GEORGIA.

DEVELOPMENT OF PERMITTING OPTIONS AND TREATMENT REQUIREMENTS; Y-12 PLANT, OAK RIDGE, TN.

NPDES permit requirements were projected based on water quality requirements, stream characteristics, and technology-based requirements and treatment upgrading alternatives to meet these requirements for five on-site treatment systems.

WATER REUSE

DEVELOPMENT AND DESIGN OF WASTEWATER TREATMENT SYSTEM AND WATER REUSE SYSTEM FOR A PHARMACEUTICAL PLANT, WARNER-LAMBERT (NOW PFIZER), VEGA BAJA, PR.



JOHN H. KOON, Ph.D., P.E., NAE

This plant including the water reuse plan was the recipient of several design and performance awards including the WEF Schroepfer Medal for Innovative Design.

DEVELOPMENT AND DESIGN OF A WASTEWATER TREATMENT SYSTEM AND WATER REUSE SYSTEM FOR A PHARMACEUTICAL BIOTECH PLANT, AMGEN, JUNCOS, PR.

DEVELOPMENT OF A WASTEWATER TREATMENT AND WATER REUSE SYSTEM FOR AN ELEMENTAL PHOSPHORUS PLANT, HOOKER CHEMICALS (NOW OXYCHEM), COLUMBIA, TN.

An innovative treatment system was developed and designed for this site which included a new process for the removal of elemental phosphorus to the detection limit.

DEVELOPMENT OF A BASE-WIDE WATER REUSE PLAN, U.S. ARMY, FT. LEWIS, WA.

DEVELOPMENT OF WATER REUSE PLANS FOR A PHARMACEUTICAL PLANT, JENSSON (PART OF J&J), GURABO, PR.

DEVELOPMENT OF A CLOSED CYCLE WASTEWATER TREATMENT AND WATER REUSE SYSTEM FOR COMMERCIAL APPLICATION (THE CYCLET® PROCESS), THETFORD CORPORATION, ANN ARBOR, MI. Worked with a client team to develop the technology for a system capable of managing black and grey water and treating to a level for reuse. The process, was developed in the late 1970's and, though modified, is still on the market.

ENVIRONMENTAL PERMITTING

ENVIRONMENTAL PERMITTING FOR A GREENFIELD CHEMICAL PLANT SITE, CONFIDENTIAL CHEMICAL INDUSTRY CLIENT, SOUTHEASTERN US LOCATIONS.

Assisted client in identifying local and national permitting issues related to all media for a new greenfield chemical plant site. Developed permitting strategies for the selected site. Interacted with site design contractor to design environmental control systems and conveyance systems to facilitate permitting.

TECHNICAL SUPPORT FOR CHALLENGES TO REVISED PHARMACEUTICAL EFFLUENT GUIDELINES, PFIZER CORP., NEW YORK, NY.

Provided technical support in the development of challenges to revised draft effluent guidelines.

ENVIRONMENTAL PERMITTING SUPPORT FOR A BIO/PHARMA PRODUCTION SITE, AMGEN, JUNCOS, PR.

Supported site staff in procuring all site environmental permits. Work included river sampling using 'clean' techniques to develop good data for metals limits, water quality modeling, preparation of NPDES permit application, PR permit application, and interface with PR EQB and EPA representatives.

RESOLUTION OF PERMIT COMPLIANCE ISSUES WITH THE STATE OF TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION, BASF CORPORATION, LOWLAND TN.

WARNER-LAMBERT, INC.,(NOW PFIZER), VEGA BAJA, PR.

New discharge permit applied for and negotiated for this pharmaceutical site to govern the performance of a new WWTP on site. Work included "clean" sampling to establish metals limits, water quality modeling, preparation of technical support document, and negotiations before regulatory agencies.

REVIEW OF BAT PERMIT APPLICATION FOR AN INSTITUTE, WV CHEMICAL PRODUCTION SITE, REGION III EPA, WORK IN INSTITUTE, WV.



JOHN H. KOON, Ph.D., P.E., NAE

At the suggestion of the chemical plant site, assisted EPA in reviewing, drafting, and issuing the first BAT permit issued in EPA Region III.

ENVIRONMENTAL PERMITTING FOR A GREENFIELD CHEMICAL PRODUCTION FACILITY, MCNEIL SPECIALTY PRODUCTS, MCINTOSH, AL.

Environmental Permitting for a Greenfield Pulp Mill, Alabama River Pulp Co., Claiborne, AL.

ENVIRONMENTAL PERMITTING OF A WASTEWATER TREATMENT FACILITY, BASF CORPORATION, ENKA, NC.

Worked with site to apply for and negotiate NPDES permit for this synthetic fibers production facility.

ENVIRONMENTAL PERMITTING OF A WASTEWATER TREATMENT FACILITY, BASF CORPORATION, LOWLAND, TN.

Worked with site to apply for and negotiate NPDES permit for this synthetic fibers production facility.

RESOLUTION OF PERMITTING ISSUES WITH STATE AND FEDERAL REGULATORY AGENCIES, HOOKER CHEMICALS, COLUMBIA, TN.

Worked with this elemental phosphorus plant in resolving NPDES permit problems before State of Tennessee and Region IV EPA. New permit limits were negotiated and compliance achieved. This project was conducted during the "Love Canal" era. All meetings with regulatory agencies were attended by attorneys of regulatory agencies and US Department of Justice in addition to state and DPA regulatory agency representatives.

DEVELOPMENT AND PRESENTATION OF A PERMIT MODIFICATION PETITION, EXXONMOBIL, JOLIET, IL.

Evaluation of a refinery wastewater treatment system to evaluate problems achieving nitrification of the wastewater. Subsequently, support was provided to seek permit relief from a nitrification requirement.; provided testimony at state agency hearing; relief granted.

DEVELOPMENT OF TECHNICAL INFORMATION TO SUPPORT CHALLENGES TO THE PHOSPHORUS-DERIVED CHEMICALS EFFLUENT GUIDELINES, PHOSPHORUS CHEMICAL PRODUCERS GROUP.

Developed technical support document a group of phosphorus chemical producers to challenge EPA Effluent Guidelines for the Phosphorus Chemicals Segment of the chemical industry.

AMOCO FABRICS, ROANOKE, AL.

Provided technical support and testimony at public hearing concerning wastewater discharge and air emissions permits for the site.

GE NUCLEAR FUELS CORPORATION, WILMINGTON, NC.

Prepared storm water permit applications including technical support documents.

MUNICIPAL WASTEWATER MANAGEMENT

DEVELOPMENT AND DESIGN OF SLUDGE MANAGEMENT PLANS FOR 100 MGD CENTRAL WWTP / MUNICIPAL GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY TN.

Development of long range plan; development and design of sludge composting and dewatering facilities; rehabilitation design of incineration facilities. Roles: Team management; scope, schedule, and financial responsibility; work product quality; scope development and overview; client relations.

DESIGN OF BNR UPGRADES FOR TWO WWTP SYSTEMS, CHESTERFIELD COUNTY, VA.



JOHN H. KOON, Ph.D., P.E., NAE

DEVELOPMENT OF A PLAN FOR RECOMMISSIONING AND EXPANSION OF A REGIONAL WASTEWATER TREATMENT SYSTEM, ALLENTOWN PA, LEHIGH COUNTY AUTHORITY, PA.

FACILITIES PLANNING FOR THE MAULDIN ROAD WWTP, GREENVILLE SC, WESTERN CAROLINA REGIONAL SEWER AUTHORITY, GREENVILLE, SC.

EVALUATION OF AND DESIGN OF AN EXPANSION (OXIDATION DITCH) TO THE 60 MGD CITY OF AUGUSTA WWT SYSTEM, AUGUSTA GA, AUGUSTA COUNTY, GA.

DEVELOPMENT OF A MASTER PLAN AND DESIGN FOR A 32-MGD WWTF, CITY OF CRANSTON, RI.

TREATMENT TESTING AND PRELIMINARY DESIGN DEVELOPMENT IN A WWT SYSTEM EXPANSION, PROVIDENCE RI, CITY OF PROVIDENCE, RI.

DESIGN, STARTUP, AND TROUBLESHOOTING OF A COMMUNITY WATER RECLAMATION FACILITY INCLUDING MBRS , ATLANTA GA, CAWLEY CREEK, LLC, ATLANTA, GA.

CONTAMINATED SITE REMEDIATION INCLUDING GROUNDWATER TREATMENT

DEVELOPMENT OF SPECIFICATIONS TO GUIDE THE TREATMENT OF CONSTRUCTION DEWATERING FLUIDS AT A CONTAMINATED SITE, CHESTERFIELD CO., VIRGINIA.

Contaminants included a organic phosphorus compounds, fluorocarbon compounds and a variety of heavy metals.

DEVELOPMENT OF TREATMENT RECOMMENDATIONS FOR THE REMOVAL OF A COMPLEX ETHER AND BENZENE FROM GROUNDWATER, CONFIDENTIAL CHEMICAL INDUSTRY CLIENT, NEW JERSEY.

Performed tests to evaluate advanced oxidation processes (UV/peroxide and ozone/peroxide) for the removal of BCEE and benzene from groundwater beneath the chemical plant site.

TESTING OF CONTAMINATED SOIL AND GROUNDWATER REMOVE TWO ETHERS (BCEE AND BCEM), ROHM & HAAS, ALABAMA AND PENNSYLVANIA.

EVALUATION OF AN EXISTING SYSTEM TREATING GROUNDWATER CONTAMINATED WITH DIESEL FUEL COMPONENTS, METROPOLITAN BOSTON TRANSPORTATION AUTHORITY, BOSTON, MA.

Compared an existing vapor phase carbon adsorption system with catalytic oxidation for treatment of vapor phase petroleum hydrocarbon compounds. Also performed an evaluation of the liquid phase system to resolve problems with iron interference with the removal of petroleum hydrocarbon components.

DEVELOPMENT OF PLANS FOR THE REMEDIATION OF ORGANIC CHEMICALS AND MERCURY CONTAMINATION AT A PLANT PRODUCING CHLOROFLUOROCARBONS, CHLORINE, AND CAUSTIC, PENNWALT CORP., CALVERT CITY, KY.

Provided technical review and oversight for characterization of waste disposal units on the site, groundwater characterization, wastewater treatment systems evaluation, and development of remedial plans. Work also included regulatory interface with the State of Kentucky and Region 4 EPA.

REMEDIATION OF 1, 4 DIOXANE IN LANDFILL LEACHATE AND GROUNDWATER, LOWRY LANDFILL SUPERFUND SITE, DENVER, CO.

Identification of leachate/groundwater flows from a section of the landfill containing 1, 4 dioxane. Development



JOHN H. KOON, Ph.D., P.E., NAE

and design of a moving bed bioreactor system (MBBR; Kaldnes process) to remove the 1, 4 dioxane from the groundwater.

LAKE ONONDAGA REMEDIATION PROGRAM - CLEANUP OF WASTE PITS AT FORMER CHEMICAL MANUFACTURING SITE, HONEYWELL INC., SYRACUSE, NY.

Identification of extent of contamination of waste contained in pits associated with a closed manufacturing facility. Development of closure plans to deal with remaining sediments and water contained in the pits which was contributing to groundwater contamination.

DEVELOPMENT OF REMEDIATION PLANS FOR THE REMEDIATION OF CHROMIUM ORE FROM AN URBAN SITE, HONEYWELL, INC., JERSEY CITY, NJ.

Development of plans to implement the court-ordered remediation of this 30+ acre site to remove residual chromium ore. Plan included transportation plans, dust control plans, sediment remediation, and treatment of chromium-contaminated runoff from the site during the cleanup period.

MANAGEMENT OF CHROMIUM-CONTAMINATED GROUNDWATER FROM A FORMER CHROMIUM ORE PROCESSING SITE, HONEYWELL, INC., BALTIMORE, MD.

Projection and characterization of chromium-contaminated groundwater and runoff from this site which contained spent ore from a former chromium processing facility. A treatment system was designed and constructed to remove hexavalent chromium from the waters.

DEVELOPMENT OF PLANS TO REMEDIATE TWO CONTAMINATED SITES AT ARNOLD AFB, TN.

Work included extent of contamination evaluations; groundwater modeling; development of removal and disposal plans; design of a groundwater treatment system.

DEVELOPMENT OF A SYSTEM TO TREAT RESIDUAL CONTAMINANTS AT AN ELEMENTAL PHOSPHORUS PLANT, FMC CORPORATION, POCATELLO, ID.

Developed, designed and operated a system to treat residual waters in two ponds. Waters included elemental phosphorus, a variety of phosphites, a variety of heavy metals, complex cyanides, fluoride, and radon.

DEVELOPMENT AND DESIGN OF A UV/PEROXIDE SYSTEM FOR THE REMOVAL OF 1, 4 DIOXANE, BENZIDINE, AND OTHER ORGANICS FROM GROUNDWATER AT A FORMER PHARMACEUTICAL MANUFACTURING SITE, PHARMACIA, NORTH HAVEN, CT.

The selected system included a fluidized bed biological reactor and a UV/peroxide advanced oxidation system.

INTERNATIONAL EXPERIENCE

Worked with clients at over forty industrial locations in countries outside the U.S. Locations include South America, Southeast Asia, Europe, Canada, and Mexico.

SPECIAL RECOGNITION

Fellow, ASCE

Fellow, WEF



JOHN H. KOON, Ph.D., P.E., NAE

CEE Excellence in Teaching Award, Georgia Tech School of Civil & EnvE, 2014

W Wesley Eckenfelder Industrial Water Quality Lifetime Achievement Award, given by the Water Environment Federation, 2014

Teaching Excellence Award, Georgia Tech Women in Engineering Program, 2014 (selected by undergraduate women engineering students)

Outstanding EnvE Faculty Award given by (GaTech AEES) – 2013

Advisor to Georgia Tech InVenture Prize winning undergraduate design team – 2014 (winner of \$20,000 First Prize & \$5,000 People's Choice awards)

Member, Academy of Distinguished Alumni, CEE, University of California-Berkeley - 2013

Tau Beta Pi

Chi Epsilon, founding president, Vanderbilt University chapter, 1967

Shield of Irene Award given by the DuPont Safety, Health, and Environmental Division for Excellence in Engineering Design, 1994

DuPont - Victoria, Texas Plant Quality Award for the Deep Well Elimination Project, 1996

BASF Water Team Award of Merit, 1996

PROFESSIONAL SOCIETY ACTIVITY

Accreditation Board for Engineering and Technology (ABET), Program Evaluator for Environmental Engineering programs 2001-present; Engineering Accreditation Commission Executive Committee 2009-2013; Commissioner 2005-2010; ABET Board of Delegates member 2015-present; Applied and Natural Sciences Area Delegation, Secretary 2018-present.

American Academy of Environmental Engineers (BCEE), Education Committee, Chair 2001-2004; committee member 2005-present; Georgia state representative 1997-2004.

Water Environment Federation (WEF Fellows Selection Committee 2013-present; Awards Committee; 2000-present, Canham Scholarship Subcommittee member 2000-present, chair 2013-present; Rudolfs Medal Subcommittee Chair 2008-present; Industrial Water Quality Lifetime Achievement Award Subcommittee Chair 2008-present; former member of Program Committee; Hazardous Waste Committee; Industrial Waste Committee; Industrial Wastes Symposium Committee)

American Society of Civil Engineers, Fellow; Specialty Certification Task Force

American Water Works Association

COMMUNITY LEADERSHIP

Westminster Presbyterian Church, Nashville, TN, Deacon and Elder – 1975-1978

Trinity Presbyterian Church, Atlanta, GA, Elder and Member of Church Executive Committee – 1996-1998; Sustainability Committee Chair 2009-present



JOHN H. KOON, Ph.D., P.E., NAE

Boy Scout Troop 31, Nashville, TN, Troop Committee Chair – 1986-1990

Harding Academy, Nashville, TN, Board Member and President – 1981-1985

Westminster School, Nashville, TN Board of Directors, – 1987-1990 (school for learning disabled children)

Georgia Institute of Technology, Academic Senate representative for School of Civil and Environmental Engineering – 2012-2015

PUBLICATIONS (PARTIAL LISTING)

Author of over fifty publications and conference presentations. Selected ones listed below.

Rushing, J.C., Koon, J.H., and Tucker, D., A Review of Acid Rock Drainage Sulphate Treatment Methods, Enviromine 2009 Proceedings, Santiago, Chile, 2009.

Rushing, J.C., Bott C.B., and Koon J.H., “Using Simple Numerical Methods to Solve Complicated Mass Balance Problems,” WEF Industrial Water Quality Conference Proceedings, 2007.

Koon, J.H., “Experience with Denitrification of Industrial Wastewaters, Virginia Water Environment Association Industrial Wastewater Seminar, 2006.

Plazio, L.J., Bott, C.B., Rushing, J.C., Steiner, M.F., Plauger, J.C., and Koon, J.H., “Reconfiguration of an Industrial Wastewater Treatment System for PCB, Phenol, Zinc, and Suspended Solids Removal and Installation of a Biological Leachate Treatment System at a Former Viscose Rayon Production Facility. Proceedings of the 78th Annual Water Environment Federation Technical Exposition and Conference (WEFTEC – National Conference of the Water Environment Federation), 2005.

W. Plaehn, W., Stanfill, J.C., Koon, J.H., Shangraw, T., Bollman, D., and Richtel, S., “Full-

Scale Treatment of 1, 4 Dioxane Using a Bioreactor, Battelle Conference Proceedings, 2005.

Stanfill, J.C., Koon, J.H., Plaehn, W., Murphy, M., “1, 4 Dioxane Biodegradation Pilot Study at the Lowry Landfill Superfund Site,” WEFTEC Proceedings, 2004.

Stanfill, J.C., Koon, J.H., Shangraw, T., Bollmann, D., “1,4-Dioxane Bio-Degradation Bench Study At The Lowry Landfill Superfund Site,” Proceedings of the WEF/A&WMA 10th Annual Industrial Wastes Technical and Regulatory Conference, 2004.

Bott, C.B., Brummer, J.R., and Koon, J.H. “Pretreatment of Phosphorus Plant Process Wastewater Containing Elevated Levels of Phosphite, Hypophosphite, Cyanide, and Heavy Metals,” Proceedings of the Water Environment Federation 9th Annual Industrial Wastes Technical and Regulatory Conference, 2003.

Bott, C.B., Brummer, J.R., and Koon, J.H., “Physical-Chemical Pretreatment of Process Wastewater from a Phosphorus Plant for Discharge to a POTW,” Proceedings of the WEF Industrial Wastewater Treatment and Best Available Technologies Conference, 2003.

Bott, C.B., Plazio, L.J., Rushing, J.C., Koon, J.H., and Metcalf, T.J., Treatment of Acid Mine Drainage at an Inactive Pyritic Mineral Mine Using Constructed Wetlands and a Waterwheel Quicklime Feeder, Proceedings of the WEF/AWMA 10th Annual Industrial Wastes Technical and Regulatory Conference, 2004.



JOHN H. KOON, Ph.D., P.E., NAE

Bott., C.B., Martin, T., Koon, J.H., Brooks, P., Rich, P., Bement, D., and Cutler, W., "Physicochemical and Biological Treatment of a Concentrated Industrial Leachate from Aged Process Waste at a Viscose Rayon Production Facility," Proceedings of the Water Environment Federation 75th Annual Technical Conference and Exposition, 2002.

Lund, D.J., Koon, J.H., Patrick, G.C., Rodriguez, J., Robles, B., and Tracey, K., "Reuse of Wastewater at a Pharmaceutical Plant," WEFTEC Proceedings, 1998.

Ganze, K.G., Cashion, B.S., Koon, J.H., Davoren, D.J., and Donohoe, C., "Moving Bed Aerobic Treatment of Exxon Baton Rouge Chemical Plant (BRCP) Wastewater, WEFTEC Proceedings, 1997.

Oppelt, M.K., Levine, L., Frank, P., Ganze, K., Kowalik, J., and Koon, J.H., "Predicting Air Emissions Compliance Using Activated Sludge as a Control Device," WEFTEC Proceedings, 1996.

Koon, J.H., Griffith, D.B., and Keough, E.B., "Planning for the Elimination of Deep Wells: Developing Environmentally Compatible Technologies for the Disposal of a Chemical Plant Waste," Proceedings of the 1996 Environmental Technology Conference, Clemson University, 1996.

Dell, J.J., Koon, J.H., Griffith, D.B., Robertaccio, F.L., Hockenberry, M.R., McManus, C.N., and Dragotta, D.A., "Planning for the Elimination of Deepwells: Development of a Process to Treat a High COD, High Nitrate Wastewater," WEFTEC Proceedings, 1995.

Atere-Roberts, S.O., and Koon, J.H., "Self-Monitoring to Meet General Permitting Requirements for Storm Water Discharges from Industrial Facilities," Proceedings of the Industrial Pollution Control Conference, Georgia Water Pollution Control Association, 1993.

Koon, J.H., and Boggs, F.L., "Applications of a Kinetic Analysis Using Historic Operating Data to Redesign an Industrial Activated Sludge System, Proceedings of the 48th Industrial Waste Conference, Purdue University, 1993.

Koon, J.H., "Designing and Operating Groundwater Treatment Systems: Still Trying to Get It Right," 1993.

Koon, J.H., "Resolving Complex NPDES Permitting Issues at a Major Industrial Plant," Proceedings of the 1993 Food Industry Environmental Conference, Georgia Institute of Technology, 1993.

PROFESSIONAL CONTINUING EDUCATION SEMINARS

Presented lectures at over 50 professional continuing education seminars on topics related to wastewater characterization and treatment; operation of wastewater treatment systems; and hazardous waste management. Seminars organized by/for a variety of organizations including universities, professional organizations, industrial manufacturing corporations, and government agencies.

APPENDIX B: REFERENCES

APPENDIX B: REFERENCES

Ackerman, D.G., and R. Scofield, 1981. *Guidelines for the Disposal of PCBs and PCB Items by Thermal Destruction*, Industrial Environmental Research Laboratory, U.S. EPA, EPA-600/S2-81-022, July.

ANSI, 1974. *American National Standard: Guidelines for Handling and Disposal of Capacitor- and Transformer-Grade Askarels Containing Polychlorinated Biphenyls*. ANSI C107. 1-1974.

Applegate, Howell, Hall, Jr., and Smith, 1957. *Toxicity of 4,346 Chemicals to Larval Lampreys and Fishes*, U.S. Dept. of the Interior, Fish and Wildlife Service, Special Scientific Report – Fisheries No. 207, March. Reprinted in USEPA document EPA560/6-87-002

Cameron, Roderick A., EDF, 1970. Letter to Pierre Wilkins, Monsanto. August 24.

CH2M Hill. *Feasibility Study North Landfill*. Prepared for the City of Spokane, Washington. 1988
40 CFR 761.62

Committee on Interstate and Foreign Commerce, 1979. *Waste Disposal Site Survey*. October.
Consent Decree State of Washington Department of Ecology (Plaintiff) v. Spokane County (Defendant), Case No. 88-5-0005-5. 1988.

Drinker, C. K., 1938. *Report to the Monsanto Chemical Company*. September 15. MONS 048123 – MONS 048135.

Drinker, C. K., 1939. *Further Observations on the Possible Systemic Toxicity of Certain of the Chlorinated Hydrocarbons with Suggestions for Permissible Concentrations in the Air of Workrooms*. **The Journal of Industrial Hygiene and Toxicology**, vol 21, pp. 155 – 159.

Duke, T. W., Lowe, J. I., and Wilson, A. J., 1970. *A Polychlorinated Biphenyl (Aroclor 1254) in the Water, Sediment, and Biota of Escambia Bay, Florida*. **Bulletin of Environmental Contamination and Technology**, 5(2): 171-180.

41 Federal Register (FR) 14134 – 14136

41 FR 53692

42 FR 26564-26577

43 FR 7150-7164

43 FR 7159

Fifteen-Year Experience Proves Efficiency of Garbage Incinerator. Engineering News Record, 137:10, 124-126. 1946.

Fishbein, L. 1973. **Chromatography of Environmental Hazards, Volume II, Metals, Gaseous and Industrial Pollutants**. pp. 535 – 540.

<https://www.cryptomuseum.com/crypto/bombe/index.htm> (Website accessed on 04/30/2019).

<https://www.ge.com/reports/post/74545089329/eyes-on-the-nobel-prize-ge-has-employed-2-nobel/> (Website accessed on 04/29/19).

<https://www.epa.gov/pcbs/frequent-questions-about-polychlorinated-biphenyl-pcb-guidance-reinterpretation> (Website accessed on April 29, 2019).

<https://spokanriver.net/wastedirectory/vendor/north-county-transfer-station-trash-clean-green/> (Website accessed on November 8, 2019).

<https://spokanriver.net/wastedirectory/vendor/valley-recycling-centertransfer-station/> (Website accessed November 8, 2019).

<http://spokanewastetoenergy.com/WastetoEnergy.htm> (Website accessed November 10, 2019).

<https://waste.zendesk.com/hc/en-us/articles/211677218-What-is-the-Solid-Waste-Disposal-Act-of-1965> (Website accessed 05/01/19).

Manufacturing Chemists' Association, Inc. (MCA), 1946, 1949, 1953, 1956, 1961, and 1970. *Guide to Precautionary Labeling of Hazardous Chemicals, Manual L-1*.

MCA, 1961. *Recommended Safe Practices and Procedures, Disposal of Hazardous Wastes*. Safety Guide SG-9.

MCL000005-MCL000012

MCL000094 – MCL000105

MCL000184–190

MCL000397–398

MCL000440-461

MCL000611-640

MCL000691-696

MCL02794-2960

MCL003102-3418

MONS 0444175 - MONS 044183

Monsanto, 1943. *The Aroclors, Physical Properties and Suggested Applications*. **Application Data Bulletin No. P-115**. p. 11. MONS 080143.

Monsanto, 1955. *An Indirect Aroclor Heater for Unit Chemical Operations*. **Monsanto Technical Bulletin No. O-130**. MONS 076335 – MONS 076340.

Monsanto, 1960. *Aroclor Plasticizers*. **Monsanto Technical Bulletin No. PL-306**. PCB-ARCH0266982 – PCB-ARCH0267037.

National Academy of Science - National Research Council, 1946. *Industrial Research Laboratories of the United States, Including Consulting Research Laboratories*. Bulletin of the National Research Council, Number 113, pp. 128 - 130.

National Academy of Science - National Research Council, 1960. *Industrial Research Laboratories of the United States, Eleventh Edition*. Publication 844, pp. 207 -210.

National Academy of Science - National Research Council, 1960. *Industrial Research Laboratories of the United States, Eleventh Edition*. Publication 844, p. 335.

National Academy of Science - National Research Council, 1960. *Industrial Research Laboratories of the United States, Eleventh Edition*. Publication 844, p. 383.

National Academy of Science - National Research Council, 1960. *Industrial Research Laboratories of the United States, Eleventh Edition*. Publication 844, pp. 508 - 513.

Notes on the News, **New Scientist**, p. 612. December 13, 1966.

Oppelt, E. Timothy, 1987. *Incineration of Hazardous Waste – A Critical Review*. **JAPCA**, 37(5): 558-586. May.

PCB-ARCH0036393-396

PCB-ARCH0048654

PCB-ARCH0048779.

PCB- ARCH0080304-305

PCB-ARCH0163690-693

PCB-ARCH0163708-715

PCB-ARCH0168626-633

PCB-ARCH0168665-692

PCB-ARCH0168693-725

PCB-ARCH0206370-397

PCB-ARCH0227266

¹ PCB-ARCH0247276-290

PCB-ARCH0255676-711

PCB-ARCH0277364-388

PCB-ARCH0232916 – PCB-ARCH0232917

PCB-ARCH0298272-0298286

PCB-ARCH0450243 - PCB-ARCH0450244

PCB-ARCH0502393-96

PCB-ARCH0523916-943

PCB-ARCH0588885–905

PCB-ARCH0616206 – PCB-ARCH0616227

PCB-ARCH0617319 – PCB-ARCH0617360

Peakall, D.B. and Lincer J. L., 1996. *Do PCBs Cause Eggshell Thinning?* **Environmental Pollution**, Vol. 91, pp. 127-129

Peterson, Arthur E., 1913. *Waste Disposal in Spokane*. **Municipal Journal**, 34:7, pp. 239-240.

Peterson, Arthur E., 1918. *Reconstruction of Spokane Incinerator*. **Municipal Journal**, 44:1, pp. 1-3.

Pier, A. F., 1972. *Monsanto Company, Incineration of Polychlorinated Biphenyls. Review Copy*, August 21.

PRC, 1968. **1968 Annual Report**.

Public Law 89-272, October 20 ,1965.

Public Law 91-512. October 26, 1970.

Public Law 94-580. October 21, 1976.

Risebrough, R.W.; Rieche, P.; Peakall, D. B.; Herman, S. G.; and Kirven, M. N. 1968.

Polychlorinated Biphenyls in the Global Ecosystem. Nature, Vol. 220, pp. 1098–1102.
December 14. (PCB ARCH0105220 – PCB-ARCH0105224).

Schell, J. D., Budinsky, R.A., and Wernke, M.J., 2001. *PCBs and Neurodevelopmental Effects in Michigan Children: An Evaluation of Exposure and Dose Characterization. Regulatory Toxicology and Pharmacology*, Vol 33, pp. 300-312.

“The Spokesman-Review.” March 25, 2013.

<https://www.spokesman.com/stories/2013/mar/25/officials-seek-alternatives-to-burning-off/>
(Website accessed on November 8, 2019).

Treon, J. F., Cleveland, F. P., Cappel, J. W., and Atchley, R. W., 1956. *The Toxicity of the Vapors of Aroclor 1242 and Aroclor 1254. Industrial Hygiene Quarterly*, June, pp. 204 – 213.

United States Department of Commerce, Interdepartmental Task Force on PCBs. 1972.
Polychlorinated Biphenyls and the Environment. pp. 3, 4, and 102

United States Environmental Protection Agency (USEPA), Undated document. *PCB Marking and Disposal Regulations Support Document*. p. 23.

USEPA, 1976. *PCBs in the United States Industrial Use and Environmental Distribution*.
EPA 560/6-76-005. Prepared by Versar, Inc. February 25.

USEPA, 1979. *Polychlorinated Biphenyls 1929 – 1979: Final Report*. EPA 560/6-79-004.
Prepared by Versar, Inc. May.

Washington Department of Ecology. Undated document. *Hazard Assessment, Spokane Intercollegiate Research and Technology Institute, Riverpoint Drive, Spokane Washington 99202*.

Washington Department of Ecology. 1984. *Potential Hazardous Waste Site Preliminary Assessment, Summary Memorandum, Mica Landfill (Spokane County), Highway 27, Mica, Washington*.

Washington Department of Ecology. 2001. *EPA Superfund Record of Decision, Mica Landfill, EPA ID: WAD980511661, OU 01, Mica, Washington*.

Washington Department of Ecology, Toxics Cleanup Program, 2015. *Marshall Landfill Site*.
Publication No. 15-09-023. February.

WATER_PCB-00011562 – WATER_PCB-00011613.

Watt, L. A., 1937. Memo, October 11. PCB-ARCH0177742.

Transcript for 30(b)6 Deposition of Scott K. Windsor, September 13, 2019 (“Windsor
Deposition”)

Windsor Deposition, Exhibit 6.

Windsor Deposition, Exhibit 7.

Windsor Deposition, Exhibit 8.

Wood, E. M., 1953. *The Toxicity of 3,400 Chemicals to Fish*. Hollis, E. H. and Lennon, R. E.,
1954. *The Toxicity of 1,085 Chemicals to Fish*. Reprinted in USEPA document EPA560/6-
87-002.


EXHIBIT B

Expert Report of Gerald Markowitz, Ph.D. and David Rosner, Ph.D.

**City of Spokane v.
Monsanto Company, et al.**



Gerald Markowitz, Ph.D.



David Rosner, Ph.D.

October 11, 2019

Summary of Opinions

Based on review and analysis of documents and information identified within our peer reviewed and published article [attached as Exhibit A], additional documents within the Monsanto PCB Archive [see list of documents relied upon attached as Exhibit B], and the depositions in the *Westport*, *Colella* and *San Diego* cases, and based on past work serving as both consultant and testifying experts assisting counsel representing plaintiffs in cases alleging harm to human health and the environment caused by PCBs, as well as over 30 years of research and writing on the history of environmental health and occupational safety and health, we have formed opinions based on a reasonable degree of certainty. Our *curriculum vitae* are attached as Exhibits C and D, and our lists of prior testimony are attached as Exhibits E and F. Our billing rate is \$350 per hour. Our opinions are as follows:

- I. PCBs were envisioned by Monsanto and promoted as ingredients in a wide variety of products that Monsanto had sufficient information available to it to know would be used, handled, and consumed in ways that would make it virtually inevitable that PCBs would enter the environment, and get into the food chain and human bodies.¹ In particular:
 - a. Kaley testified that the chemical properties that enable bioaccumulation are resistance to degradation and fat solubility, that the chemical structure of PCBs has been known since the 1800s, and that Monsanto understood from the beginning that PCBs were fat soluble. (Kaley, pp. 31-33; 64-68; 75-77)²
 - b. Kaley also testified (and Monsanto's documents indicate) that Monsanto was aware by the 1930s that PCBs were persistent in the environment and resisted biodegradation. (Kaley, pp. 21-22; 31, 34) In fact, Monsanto promoted PCBs as such.³

¹ The Swann Chemical Company, "Aroclor Use Code," January 1, 1935 [Footnote from Report: N 8; Hereafter FN #]; Swann Chemical Company, "Aroclor Adhesives," February 10, 1933; Swann Chemical Company, "Aroclor as a Lubricant," February 10, 1933; Swann Chemical Company, "Various Uses of Aroclors," January 1, 1935; W.E. Schalk to J.W. Schrage, May 11, 1970.

² Monsanto Chemical Company, "Salesmen's Manual Aroclor," Description and Properties, October 1, 1944. [FN 21]

³ Swann Chemical Company, "A Brief Description of the Aroclors," February 20, 1931 [FN 7]; Swann Chemical Company, "Aroclor in Lacquers," January 1, 1936 [Supercedes February 10, 1935]; "Development Department Annual Research Report – 1946" "Confidential, Annual Research Report, 1946, 1946, 111; Monsanto Company, *The Aroclors: Physical Properties and Suggested Applications*, (1946); Ad, "The Ubiquitous Aroclor 'Genie' Does it Again," *Adhesive Age*, December, 1961, 57; Elmer Wheeler to W.R. Richard, "Aroclor Degradation in Soil," April 8,

- II. Based on the documents and Kaley testimony (Kaley, pp. 324-326, 455), Monsanto – very early on -- had sufficient information available to it to know that PCBs, when used as intended in transformers and capacitors, as industrial fluids (hydraulic fluids and heat transfer fluids), as well as when incorporated into a wide variety of products now referred to as “open uses,” would be released and cause harm to human health and the environment. In particular:
- a. Monsanto’s own early experiences, studies and reports from customers indicated that PCBs would emanate out of the “open use” products in which they are incorporated (such as paint);⁴ would leak from what were considered “closed uses” (transformers and capacitors) during use and repair;⁵ would leak when used as industrial fluids;⁶ and would even be released during transport via tanker truck and drums.⁷ With respect to the “possible control of contamination,” Monsanto stated “[i]ndustrial fluids, plastics, coatings and adhesives [are] – very difficult, if not impossible to control.”⁸
 - b. In addition to releases to the environment from intended applications of PCBs, Monsanto also encountered repeated “violations” by its customers of safety

1969 [FN 24]; “Monsanto, Rough Draft – Outline PCB Environmental Pollution Abatement Plan,” November 10, 1969 [FN 90]; W. Papageorge to F.G. Jenkins, July 8, 1970.

⁴ Wheeler to E. Mather, “Aroclors Toxicity,” September 1, 1953 [FN 42]; Research Department, Phosphate Division, “Report No. 2970 Final Report on Aroclor in Gases,” March 15, 1954 [FN 46]; “Minutes of Aroclor ‘Ad Hoc’ Committee First Meeting,” September 5, 1969 [FN 107]; Emmet Kelly to W. B. Papageorge, March 30, 1970 [FN 120]; William Ryan to John Mason, June 18, 1970; Monsanto, “Executive Summary: PCB Pollution,” 10/29/69. [FN 111]

⁵ “Trip Report 214: Westinghouse Electric and Manufacturing Company,” October 14-15, 1942; Alvin Crow to Monsanto Chemical Corporation, April 15, 1966; W.R. Richard to E. Wheeler, “Defense of Aroclor – F. Fluids,” September 9, 1969 [FN 108]; “The PCB-Pollution Problem,” January 21 and 22, 1970, Meeting with General Electric Co. [113]; Don Olsen to ‘Dear Sir,’ February 18, 1970 [FN 116]; Functional Fluids, Sales Information Bulletin No. 58, Subject: Dielectric Fluids – Environmental Safety, October 14, 1971; W. Papageorge to A. Pozefsky, May 2, 1973.

⁶ Elmer Wheeler to E. Mather, September 1, 1953 [FN 42]; Richard Davis to File, The Frito Company, October 18, 1960 [FN 65]; Elmer Wheeler to Ken Doremus, June 16, 1961; “Report of Aroclor ‘Ad Hoc’ Committee,” Confidential, October 2, 1969 [FN 109]; W.R. Richard, “Monthly Summary with Details for Functional Fluids-Research,” May 20, 1970; William Blair, “Senate Told of Fish Tainting,” *New York Times*, Aug. 15, 1971, A-22 [FN 156]; D. E. Roush to John Heilala, January 15, 1970. [PCB-ARCH0483868]

⁷ Alvin Crow to Monsanto Chemical Corporation, April 15, 1966; W.E. Gordon to Grey, Papageorge et. Al., September 13, 1967; Monsanto “Memo Complaint Investigation,” September 20, 1966; M.N. Ferrar et. al, to Howard Bergen, Jr., “Report of Aroclor ‘Ad Hoc’ Committee,” Confidential, October 2, 1969 [FN 109]; T.N. Carrico to G.L. Bratsch, “Specific Recommendation #4 – Major Spill Investigation No. S2-2-70,” January 6, 1971; P.G. Benignus to R.S. Hill, “Aroclor Drums,” December 22, 1971; P.G. Benignus to E.M. Potter et. al., “Aroclor Drums,” December 17, 1971 [FN 169]; John Mason to J.R. Eck, “Therminol FR Series Fluids,” August 16, 1971; D. Wood to C. Paton et. al., “PCB Incineration,” May 29, 1975. [MONS 029736]

⁸ Monsanto, “Executive Summary: PCB Pollution,” 10/29/69. [FN 111]

precautions resulting in PCB leaks and spills. In regards to the “[m]ain sources of pollution,” Monsanto admitted that “[m]anufacturing plants [are] also a vulnerable contributing factor, but less significant in quantity than customer or end user loses.”⁹ Therefore, Monsanto had sufficient information available to it to know that this misuse would and did result in additional releases into the environment.¹⁰

- c. Disposal of PCB waste and products containing PCBs at the end of their useful life also typically ended up in the environment. Monsanto sewered PCB waste at the facilities where PCBs were manufactured from the 1930s and for decades. Monsanto’s own documents evidence Monsanto’s awareness that its customers were doing the same.¹¹
- d. In addition to being intentionally released into sewers or streams, PCB waste was also put in landfills or burned.¹² Kaley testified the only way to destroy PCBs would be to incinerate at a very high temperature. In addition, Monsanto’s documents and the Kaley testimony indicate the only ways to dispose of PCB waste are incineration at proper temperatures, putting it in a landfill, or indiscriminate dumping.¹³ However, the only incinerator capable of properly incinerating PCBs did not come on line until 1971, so prior to that time, all waste was either put into dumps/waste sites or directly into the environment.¹⁴ As late as 1975 Monsanto said that “the only practical method of disposal of solid waste

⁹ “Executive Summary: PCB Pollution,” 10/29/69. [FN 111]

¹⁰ Monsanto, Organic Chemicals Division, “Standard Manufacturing Process for Pydraul A-200,” Dec. 1970; Papageorge to Gene Lewis, July 7, 1970; “Minutes of Aroclor ‘Ad Hoc’ Committee, First Meeting,” September 5, 1969 [FN 107]; “Executive Summary PCB Pollution,” [Company Confidential] October 29, 1969. [FN 111]; Seppala to R. E. Kelly, “Re: Czarnecki, et. al Versus Monsanto,” June 28, 1963; Wheeler to Davis, “Aroclor 1242 – Reliance Electric,” September 3, 1965 [FN 69]; Benignus to Smith, “Agreement,” February 29, 1952. [FN 40]

¹¹ McCutchen “Progress Report, Technical Service Department – Krummrich,” November 29, 1967; Davis to W.R. Richard, “FDA Aroclor Inquiry,” May 23, 1968; Richard to Kuhn [handwriting, PBH], January 17, 1969 [PCB-ARCH0303696]; Richard to Wheeler, “Defense of Aroclor,” September 9, 1969; “Report of Aroclor ‘Ad Hoc’ Committee,” to Bergen, October 2, 1969 [FN 109]; Rough Draft, “Outline PCB Environmental Pollution Abatement Plan,” Nov. 10, 1969 [FN 90]; Richard to Davis et. al., “Monthly Summary Details, April, 1970,” May 20, 1970; Papageorge to Savage, December 7, 1970 [FN 147]; Papageorge to Savage, “PCB in Plant Effluent,” January 29, 1971 [FN 149]; Papageorge, “Monsanto’s PCB Problem,” Presented at ANSI, C-107 Meeting, September 14, 1971; “Reclamation Strategy,” [Before March 1972]; “The PCB-Pollution Problem,” January 21 and 22, 1970, St. Louis Meeting with General Electric. [FN 113]

¹² Kuhn to Bergen and Richard, Comments on “Defense of Aroclor” draft, September 16, 1969; John Fredericksen to Cumming Paton, “PCB Problem Disposal of Askarel,” October 13, 1971.

¹³ Papageorge to Rollins, December 5, 1975.

¹⁴ Papageorge to Bergen, “PCB-Solid Waste Incinerator,” April 15, 1971; Benignus to Curtis, “Askarel Inspection,” July 22, 1971; Papageorge to Mary Appelhof, May 4, 1973.

containing PCBs is through burial in sanitary landfills.¹⁵ And the one incinerator available starting in 1971 could not handle solids contaminated with PCBs nor liquids which contained over 1% water.¹⁶ Monsanto could have built an incinerator capable of destroying solids, but it chose not to because of the cost. Although Monsanto had originally planned to keep its incinerator on line until 1981, it ended up refusing to take any more waste as of August 31, 1977 because of cost considerations¹⁷ and because Monsanto did not want to be required to continue its operation because of social responsibility issues.¹⁸ Monsanto did not even incinerate all of its PCBs waste – between 1.5 and 3 million pounds were shipped to Texas.¹⁹ In the end, Monsanto’s incinerator “handled relatively minor quantities of retrieved wastes (less than 10% of [the incinerator’s] annual capacity)”²⁰ and although Monsanto claimed in 1977 that “most customers and industrial users disposed of waste through commercial facilities approved to dispose of PCBs,” as of 1978 there were no disposal sites (either incineration or burial) which had been approved by the EPA.²¹ Therefore, Monsanto had sufficient information available to it to know that this PCBs waste would ultimately make its way into the environment.²² (Kaley, pp. 455-59; 463, 476-79; 482-3)

- e. In fact, Monsanto’s own consultant warned that of the 40 million pounds of PCBs used annually in plasticizers, hydraulic fluid, adhesives, and in carbonless copy paper (CCP), “a very substantial percentage must escape into the environment as waste,” that “it seems possible that at least 10 million pounds annually may become environmental contaminants,” and concluded that because of the “apparent

¹⁵ Papageorge to Rollins, December 5, 1975.

¹⁶ Papageorge to Hansen, October 11, 1973; J.J. Roder to C. Paton et. al., “NOT FOR DISTRIBUTION,” “Chemical Cleaning Methods for Therminol FR,” January 10, 1972. [PCB-ARCH0506095]

¹⁷ “PCB Facilities Decontamination and Dismantlement Program,” November 3, 1977; J. Alley to D. Wood, “Recommendation on Stopping Customer Returns of PCB Waste to the W.G. Krummrich Incinerator,” May 13, 1977.

¹⁸ Alley to Wood, “Recommendation on Stopping Customer Returns,” May 13, 1977; Alley to Customer, August, 1977.

¹⁹ “Waste Disposal Agreement Between Monsanto and Rollins Environmental Services, Inc.,” July 20, 1977.

²⁰ “Questions and Answers to be Used Only to Respond to Direct Questions from the Media,” Second Draft, November 4, 1977.

²¹ “Questions and Answers to be Used Only to Respond to Direct Questions from the Media,” Nov. 4, 1977; Liss and Cordray to Barber et. al., “EPA Manual for Enforcement of PCB Regulations,” May 11, 1978 [PCB-ARCH0741749]; Toxic Materials News, December 12, 1979, p. 396.

²² “PCB Position Statement, 1977 Annual Meeting,” April 19, 1977; Steven Jellnek, “PCBs: Pollution, Politics and Prevention,” *The Rollins Report*, April, 1983.

stability” of PCBs “most of the PCBs that entered the environment may still be circulating in the global ecosystem.”²³ It was recognized that DDT and “other chlorinated hydrocarbon pesticides” were likely present “in practically every living organism and in the air, water and soil across the face of the globe.”²⁴

- f. Based on Monsanto’s documents and Kaley’s testimony (Kaley, pp. 178-182; 196, 214, 225) from the very beginning (early 1930s) there were a number of published²⁵ health studies on animals and papers documenting health effects in humans caused by exposure to PCBs and other chlorinated hydrocarbons. In addition, there were communications from Monsanto’s own customers documenting numerous ailments claimed to be a result of PCB exposure.²⁶ Older Monsanto employees remembered as late as 1971 of early outbreaks of systemic

²³ Robert L. Metcalf, “Report and Comments on Meeting on Chlorinated Biphenyls in the Environment at Industrial Biotest Laboratories, Chicago, March 21, 1969,” Apr. 2, 1969. [FN 100]

²⁴ Wheeler –“CMC Pre[sentation] Medical Department, Gentlemen,” n.d. [STLCOPCB0009863]

²⁵ Jack Jones and H. Alden, “An Acne Dermatogiosis,” *Archive of Dermatology and Syphilology*, 33(1936), 1023-1027; C. Drinker, M. Warren, G. Bennett, “The Problem of Possible Systemic Effects from Certain Chlorinated Hydrocarbons,” *J. of Industrial Hygiene and Toxicology*, 19 (September, 1937), 283; Commonwealth of Pennsylvania, Department of Labor and Industry, “A Preliminary Report of the Dermatological and Systemic Effects of Exposure to Hexachloro-Naphthalene and Chloro-Diphenyl,” March 16, 1936; L. Schwartz, “Dermatitis from Synthetic Resins and Waxes,” *AJPH*, June, 26(1936), 586; F.B. Flinn and N. Jarvik, “Action of Certain Chlorinated Naphthalenes on the Liver,” *Proceedings of the Society for Experimental Biology*, 35(October, 1936), 118-120; Frederick Flinn and N. Jarvik, “Liver Lesions Caused by Chlorinated Naphthalene,” *American Journal of Epidemiology*, 27(January, 1938), 19-27; G. Bennett, C. Drinker, M. Warren, “Morphological Changes in the Livers of Rats Resulting from Exposure to Certain Chlorinated Hydrocarbons,” *Journal of Industrial Hygiene and Toxicology*, 20(Feb. 1938), 97-128; L. Greenburg, M. Mayers and A. Smith, “The Systemic Effects Resulting from Exposure to Certain Chlorinated Hydrocarbons,” *Journal of Industrial Hygiene and Toxicology*, 21(February, 1939), 29-38; L. Greenburg, “Chlorinated Naphthalenes and Diphenyls,” *Industrial Medicine*, 12(August, 1943), 520-623 [FN 5]; J. W. Miller, “Pathologic Changes in Animals Exposed to a Commercial Chlorinated Diphenyl,” *Public Health Reports*, 59(Aug. 1944), 1085-1093; F. Flinn, “Industrial Exposure to Chlorinated Hydrocarbons,” *American Journal of Medicine*, 1(October, 1946), 388-394; L. Fairhall, “Chlorinated Diphenyl and the Chloronaphthalenes,” *Industrial Toxicology*, pp. 257-258, (1949 ed). [FN 22]; J. Meigs, J. Albom, B. Karlin, “Chloracne from an Unusual Exposure to Aroclor,” *JAMA*, 154(April 24, 1954), 1417-1418.

²⁶ Davis to Arbogast, “Bucyrus Erie Company,” March 21, 1957; Kelly to Heaesel, “Pydraul AC” June 23, 1959 [FN 61]; Wheeler to Speicher, October 23, 1959; Jack Bonavoglika, to W. Waychoff, Kelley, February 4, 1960; Kelly to Davis, “Mr. Allen Hexagon” February 2, 1961 [FN 63]; J. Allen to Kelly, February 14, 1961 [FN 64]; J. Orem to R. Davis, Re: R.S. Fulton, Chevrolet, January 23, 1963; Fershing to Monsanto Chemical Company, November 9, 1964; T.M. Steadman to Monsanto Canada, March 1, 1965; T. Tokley to D. Hardy, London, March 29, 1966; D. Roush to E. Wheeler, July 18, 1966; M. Schuitema to V.J. Herofosse, Brussels, September 1, 1967; Memo, “Chevrolet-Tonawanda Plant,” to M. Johnson, D. Pogue, February 11, 1971; D.A. Olsen to W.R. Richard, “Aroclor Toxicity” Japan, December 4, 1968; L.D. Press to File, “Plasticizer Call Report,” December 6, 1968; J. Schuch to File, re: Aroclor 4465, December 10, 1968; E. Wheeler to R. Keller, “Report on ‘Human Poisoning with Kane-Clor’” Japan, June 12, 1969; M. Frankton to Monsanto, “Pyroclor,” September 11, 1969; H. Allison to M. Jenkins, October 17, 1969; Source: Wheeler, “Public Relations Department,” “Queried by Reporter,” October 28, 1970; G. Fague to N. Johnson, “Chevrolet Grey Iron Factory, Saginaw” December 17, 1970; Kelly to D. Reed, May 2, 1973; G. Roush to W. Papageorge, re: Mobil, October 28, 1975.

disease among workers in the Anniston plant.²⁷ In fact, there are repeated internal Monsanto admissions starting in the early 1930s that PCBs are systemically toxic.²⁸ And by the 1930s and early 1940s, it was understood that even the families of workers were at risk of developing systemic disease after contact with the clothing worn home by workers.²⁹ Therefore, Monsanto had sufficient information available to it to know by the early 1930s that PCBs were harmful to human health.

- g. In the 1950s, Monsanto's own employees specifically recognized the potential harm posed to aquatic life posed by PCBs.³⁰

III. Based on Monsanto's documents and Kaley's testimony, while it was Swann that originally assisted (along with General Electric) in creating the market for PCBs as dielectric fluids, Monsanto continued to market and promote PCBs as dielectric fluids when it took over the company, shortly thereafter found other potential markets for its products, and via promotion and marketing were successful in creating the market for them. These markets included PCBs in various open uses such as in shower curtains, paints, varnishes, adhesives, rubber finishes, and others.³¹ During the 1950s, Monsanto, via its marketing and promotion, expanded the use of PCBs in such open use applications such as in Carbonless Copy Paper (CCP), in indirect heating systems for fried foods, and even as an addition to insecticides that were sprayed into the environment.³² All of this put Monsanto on notice that its PCBs could and did get into

²⁷ M. Williams to B.O. Stevenson, Handwritten note, January 20, 1971. [MONS 099489][FN 148]

²⁸ "Report of Dr. Frederick B. Flinn of Patch Tests Made on Material Received from Swann Research, Inc.," May 25, 1934 [FN 10]; "Diphenyl and Chlorinated Diphenyl Derivatives," June 1935 [FN 9]; L.A. Watt, Memo, October 11, 1937 [FN 18]; C. Drinker, "Report to the Monsanto Chemical Company," September 15, 1938; Monsanto, "Confidential, Annual Research Report, 1944," [FN 19]; Monsanto, "Salesmen's Manual Aroclor," October 1, 1944 [FN 21]; R.F.K., "Memo to File Aroclor," February 6, 1950; Kelley to Spolyar, February 14, 1950 [FN 38]; E. Mather to F. Harwood, "Aroclors: Toxicity," December 17, 1951; Wheeler to R. Kelly, "Hydraulic Fluid Discussion with Captain Stone - U.S. Navy," April 10, 1956.

²⁹ L. Schwartz, "Dermatitis from Synthetic Resins and Waxes," *AJPH*, June, 26(1936), 585.

³⁰ H.E. Morriss, "How Monsanto Controls Air and Water Pollution," *Oil and Gas Journal*, June 28, 1954, 11-16; R. Davis to R. Kelly, "Air Products Inc.," November 5, 1959; Garrett to H. Boettcher, Air Products, November 16, 1959; Garrett to S. Facini, Chicago Pneumatic Tool Co., August 29, 1960. [FN 62]

³¹ "Found! Three Industries that Can't Use Aroclors," *Saturday Evening Post*, August 3, 1946. [FN 34]; Monsanto Chemical Company Organic Chemicals Division, "St. Louis Research Report No. 2420, "Final Report on Assistance to Sales and Development Department on Aroclors, Biphenyl and Related Products, 1954," January 8, 1960., p.6; A.W. Hempelmann to R. Davis, December 15, 1958.

³² "This was Adam's Bug Killer," *Fortune*, Feb., 1946, p.17; "Confidential, Annual Research Report 1946;" Benignus to E.W. Laske "Aroclors and MB-40," June 17, 1948; Monsanto, "A Guide for Formulating Santobane, Monsanto DDT," 1951 [35]; Monsanto, "Technical Bulletin, Lindane-Aroclor Combinations," Bulletin No. 2/EX-43,

the open environment and in the food chain. (Kaley, 11/17/2011, pp. 47, 49-51, 55, 60-62)

- IV. Despite commitments of United States (US) industries to fully test substances and products that were widely distributed,³³ and despite the fact that such testing was conducted by many companies including Monsanto for other products,³⁴ Monsanto never did sufficient long-term evaluations of this product. In particular, Monsanto's documents indicate a recognition of the need to do long term chronic testing on products which might enter the food chain, such as PCBs.³⁵
- V. Monsanto did some short and medium term animal studies, certain of which put Monsanto on notice of potential health effects. In addition, in the 1950s, the Navy had done its own PCB studies, the results of which were of such concern to the Navy that they decided not to use PCBs in the application at issue (despite Monsanto's effort to convince them otherwise).³⁶
- VI. It was not until 1969, and only after others had already found PCBs to be a world-wide ecological contaminant, that Monsanto started doing actual chronic testing.³⁷ When these tests showed signs of harm to the test animals, Monsanto asked that they be repeated to get better results, hired a consultant to reanalyze the data of one study because Monsanto did not like the results, and on one occasion even asked the lab to change the conclusion so the result would sound less ominous.³⁸ Ultimately, the

February 3, 1953; Monsanto, "Aroclor," n.d.; Monsanto, "Development Department," "Liquid Dielectrics and Aroclor," August 15, 1956; "Look on the Bright Side," Johnson's Glo-Coat, March 1947; L. Sherwood, to Benignus, "Aroclor Use to Increase the Insecticidal Life of Lindane," August 30, 1957 [FN 37]; Kelly to Hempel, July 25, 1963. [PCB-ARCH0736677]

³³ National Paint, Varnish and Lacquer Association, "Confidential Not for Publication, To Class A Members," July 18, 1939, [FN 25] and Attached: Manufacturing Chemists' Association Legal Principles." Manufacturing Chemists Association, Manual L-1 – A Guide for the Preparation of Warning Labels for Hazardous Chemicals," Adopted 1945; Revised 1946 [FN 26]; Industrial Hygiene Foundation, Abstract of H. Smyth, "Solving the Problem of Toxicity of New Chemicals in Industry," *Industrial Hygiene Digest*, March, 1947; Henry Smyth, "Solving the Problem of Toxicity of New Chemicals in Industry," *West Virginia Medical Journal*, July, 1946, pp.177. [FN 29]

³⁴ Monsanto, "News Release," October 7, 1947 [FN 30]; Jack Garrett, "Toxicity Considerations in Pollution Control," *Industrial Wastes*, January-February, 1957. [FN 31]

³⁵ Kelly to Hempel, July 25, 1963 [PCB-ARCH0736677]; Robert Metcalf, "Report and Comments on Meeting on Chlorinated Biphenyls in the Environment at Industrial Biotest Laboratories, Chicago, March 21, 1969," April 2, 1969 [FN 100]; Stanley Shaw, "Therminol Heat Transfer Food Industry Penetration," October 13, 1966.

³⁶ H. Litzsinger to Garrett, May 29, 1956 [FN 52]; Kelly to Langenfeld, June 7, 1956 [FN 53]; Kelly to Armstrong, "Pydraul 150," January 21, 1957 [FN 55]; Wheeler to P. Slayton, "Toxicity of Pydraul 150," September 25, 1957. [FN 57]

³⁷ "Executive Summary PCB Pollution [Company Confidential], October 29, 1969. [FN 111]

³⁸ Benignus, "The PCB -Pollution Problem," January 21 and 22nd, 1970 Meeting with General Electric Company. January 26, 1970 [FN 113]; G. Levinskas to J. Calandra, IBT, July 18, 1975 [FN 203]; Monsanto, Press Release,

principals of the lab – the same exact individuals involved in the PCB studies – were convicted of fraud in conjunction with work done at their lab. Some of these studies at issue were done for Monsanto during the same general time frame the PCB studies were being done.

- VII. Kaley’s testimony (Kaley, 11/17/2011, pp. 37-44) and Monsanto’s documents indicate that Monsanto began making DDT, a chemical which - like PCBs - is persistent in the environment and bioaccumulates, from 1944 to 1957. Kaley also testified that Monsanto would have kept abreast of the literature regarding DDT. There were publications indicating concerns about DDT in the environment throughout the 1950s.³⁹ During that same general timeframe, Monsanto’s own Medical Director Kelly, and Manager of Industrial Hygiene and Pollution Abatement Garrett, both expressed the opinion that a company has a duty to test their products for danger to humans and the environment.⁴⁰
- VIII. Nonetheless, based on Kaley’s testimony, (Kaley, pp. 399-401) during the time Monsanto sold PCBs, Monsanto did not do any testing in order to determine how much PCBs were released from leaking drums, from customer uses, from open uses, from CCP (in the case of CCP, Monsanto pushed that a study others had done be delayed), from hydraulic fluid uses, or from landfills into which PCBs or PCB-contaminated waste were disposed. The one study that Monsanto did do in regards to burning of CCP showed it would cause environmental contamination unless the temperatures were sufficiently high.⁴¹
- IX. Monsanto did not do any biodegradation studies until well after PCBs were known to be ubiquitous environmental contaminants, and when it did, it was determined there was no significant biodegradation. In fact, in Monsanto’s “Special Study” of the “Biodegradability of Dielectric Fluids and Components” of 1976, it classified its “current, potential and competitive [dielectric fluid] products to aid in the assessment of

“Immediately 1975.”

³⁹ H. Godt, Santobane (DDT). [FN 35]

⁴⁰ Press Release, “Immediately,” October 7, 1947 [FN 30]; Garrett, “Toxicity Considerations in Pollution Control,” *Industrial Waste*, January-February, 1957, p.17-19 [FN 31]; Wheeler et al to R. Harris, “Company Confidential... Report of Aroclor ‘Ad Hoc’ Committee,” Second Draft, October 15, 1969 [FN 110]; David Rosner and Gerald Markowitz, “Persistent Pollutants: A Brief History of the Discovery of the Widespread Toxicity of Chlorinated Hydrocarbons,” *Environmental Research*, 120(2013), 126-133.

⁴¹ Papageorge to H.A. Vodden, December 15, 1970; E. Tucker to W. Richard, March 4, 1969, in “Aroclor – Wildlife: Incineration of NCR Paper.” [FN 97]

their environmental compatibility.” A biodegradability assessment was made in terms of two groupings: “Rapid to intermediate biodegradation rate” and “Slowly degraded to resistant.” Aroclors 1016, 1242 and 1254 were all in the “slowly degraded to resistant” category.⁴² Monsanto also learned that there was little to no biodegradation of PCBs earlier from other investigators.⁴³ Aroclor 1232 was described as “a blend of 1221 and 1242, which contains several per cent of very persistent isomers.”⁴⁴

- X. Based on Monsanto’s documents and Kaley’s testimony, although Monsanto provided information to its customers to avoid skin contact with PCBs and that exposure to the fumes of heated Aroclors may cause “skin and eye irritation,” for most of the 1950s Monsanto downplayed the possible systemic problems associated with PCB exposure and made continued representations to its customers and regulators that the product was safe.⁴⁵ Monsanto specifically and repeatedly represented “our experience and the experience of our customers over a period of nearly 25 years, has been singularly free of difficulties.”⁴⁶ Without conducting chronicity studies, by 1965 Monsanto would misleadingly assure DuPont that “The question of possible carcinogenesis... can be dismissed completely.”⁴⁷ Moreover, it does not appear that Monsanto provided any meaningful information that would serve to prevent PCBs from escaping into the environment until well after PCBs had already become a known ubiquitous environmental contaminant. (Kaley, 11/17/2011, pp. 224, 229, 232, 235; Kaley 463)
- XI. Despite the fact that more than 100,000 pounds, or “truckloads,”⁴⁸ of Aroclors were used in connection with pesticides as extenders – in particular as extenders for insecticides against roaches in the poultry field – and were being used in connection with other materials to make rabbit repellants and then sprayed on vegetation, and

⁴² Monsanto, “Applied Sciences Report” “Biodegradability of Dielectric Fluids and Components,” July 29, 1976.

⁴³ D. Hosmer to P. Heisler, “Pesticides in Compost Degradation of PCBs During Composting,” October 23, 1974. [STLCOPCB4076574 and STLCOPB4076575: Cover Sheet and Translated Report]

⁴⁴ J. R. Savage to A. E. Peterson, J.F. Queeny Plant, “PCB Pollution,” Sept. 23, 1970. See also, W. Clark to Bechtold et. al., “1200 Series Aroclors: Removal of Products from the Market,” May 14, 1970; Papageorge to Durland – Tokyo, “PCB Environmental Problem” May 27, 1970; R. Kountz to R. Howard, “Biodegradability of Aroclor,” June 18, 1970; Papageorge to Bergen, July 17, 1970; J. Savage to E. Peterson, “PCB Pollution,” September 23, 1970.

⁴⁵ Monsanto Technical Bulletin No. P-137, “Aroclor – A Non-Flammable Hydraulic Fluid for Die-Casting Systems,” May 1, 1950 [Supersedes March 28, 1949]; Wheeler to Lofstrom, April 8, 1957[FN 58]; Monsanto Technical Bulletin -124, “Aroclor Resins and Plasticizers for Chlorinated Rubber,” May 1957 [FN 59]; Papageorge to Albert [Westinghouse], March 18, 1975. [FN 59]

⁴⁶ R.E. Kelly to Marcus Key, US PHS. March 15, 1962. [FN 67]

⁴⁷ Kelly to Singer [Dupont], July 1, 1965. [FN 70]

⁴⁸ P.G. Benignus. Technical Sales Report. June 30, 1955. [FN 36]

despite Monsanto's awareness of the myriad releases of PCBs in the environment, Monsanto initially denied that PCBs were being found in the environment. Despite early indications that Monsanto promoted the use of PCBs as pesticide extenders,⁴⁹ Monsanto repeatedly stated "[t]o our knowledge, [PCBs] are not sprayed or dusted on crops, woodlands or any other areas, as are pesticides" and that it was "extremely difficult to conceive how commercially produced PCB can show up in wildlife in the quantities reported."⁵⁰ The effective date of the discontinuance of the sale of PCBs for use as an insecticide/pesticide carrier was not until April 1970.⁵¹ Monsanto also misrepresented the ability of its product to biodegrade in the environment.

XII. When Monsanto finally did begin to provide information about environmental concerns (only after the PCBs situation was brought to light by the US media), it was in part a result of a concern about legal liability. Monsanto was "merely fulfilling what [it] consider[ed] to be our moral and our legal responsibility to our customers"⁵² and because it endeavored to take "reasonable action that will not unduely [sic] alarm the market but reduce the exposure in terms of liability."⁵³ Monsanto's Legal Department believed this approach would "minimize and, hopefully, eliminate claims made against [it] for environmental pollution damage."⁵⁴

XIII. The "warnings" regarding environmental concerns were cursory at best. As early as 1958, one memo declared, "It is our desire to comply with the necessary regulations, but to comply with the minimum and not to give any unnecessary information which could very well damage our sales position in the synthetic hydraulic fluid field."⁵⁵

Even though the presence of PCBs throughout the environment had been confirmed by

⁴⁹ Monsanto Technical Bulletin No. 2/Ex-43, "Lindane-Aroclor Combinations," February 3, 1953, p.4; C. Williams to R. Benignus, "Aroclor – Insecticide Customers," July 25, 1955, PCB-ARCH0042817; L. Sherwood to Benignus, "Aroclor Use to Increase the Insecticidal Life of Lindane," August 30, 1957 [FN 37]; Benignus to Leake, [USDA], June 17, 1948; Kelly to Quinby, February 3, 1971; Benignus, "Lindane-Aroclor Combinations," November 26, 1952; Benignus, "Technical Sales Report," June 30, 1955. [FN 36]

⁵⁰ Final Draft. Statement from Monsanto Company. March 3, 1969 attached to "Monsanto. Executive Summary" [FN 111], See also "Statement From Monsanto Company," October 29, 1969," attached in Executive Summary, PCB Pollution," October 29, 1969, [FN 98]; Stickley to Gardner, "Effect of Aroclors on Vegetation," September 28, 1954 PCB-ARCH0577540; "Statement from Monsanto Company," October 29, 1969. [FN 111]

⁵¹ Kelley to Bechtold, et. al., "Aroclor/Insecticides," April 23, 1970.

⁵² "Presentation to Field Sales" "Personal and Confidential," [Ca Feb. 16, 1970].

⁵³ "Outline: PCB Environmental Pollution Plan," Rough Draft, Nov. 10, 1969. [FN 90]

⁵⁴ "Presentation to Field Sales" "Personal and Confidential," [Ca Feb. 16, 1970]; Papageorge to Marsh et al., "PCB Environmental Problem September Status Report," October 6, 1970; [FN 142] C. Paton, "Sales Information Bulletin, No. 89," "Company Confidential," Re: Product Liability, August 8, 1971.

⁵⁵ D. F. Smith to R. Minter, "Pydraul Labeling," December 5, 1958. [FN 60]

scientists by that time, Monsanto's letters purporting to inform their customers of the environmental problems posed by PCBs include disclaiming language such as: "we wish to alert you to the potential problem of environmental contamination,"⁵⁶ "[i]t is claimed that..." and that Aroclors with a lower chlorine content "appear to present no potential problem to the environment."⁵⁷ And even then Monsanto did not explain that sealants and other open uses of PCBs were leading to environmental contamination. Rather, Monsanto's letter indicated that widespread environmental contamination was the result of manufacturing processes. By this time, Monsanto was aware of the Yusho incident and that PCBs had been getting into milk, poultry, cooking oils and even people.⁵⁸ None of this was mentioned. No information was provided on Monsanto's knowledge of the persistent, toxic and, bioaccumulative nature of Aroclors. In a 1971 "Summary for Discussion on PCB's with FDA" it was suggested that "chlorinated biphenyls are biodegradable."⁵⁹ Monsanto specifically included a water quality standards article so as to minimize the attention on just PCBs. "We are pointing out that care will needed in preventing environmental contamination from other raw materials and products not just Aroclor 1254 and 1260."⁶⁰ Even when they did finally begin to inform their representatives in the field of the growing controversy concerning PCB and environmental pollution Monsanto planned to downplay the problems. In 1970, as they planned to send copies of informational letters to their U.S. customers they asked their regional representatives "to keep the circulation of this information to a minimum." The St. Louis office provided "questions and answer" sheets to their regional people for the aid of their salesmen and instructed them "to answer only those questions they are asked and not to put those answers in writing," The salespeople were also "told not to volunteer information not covered in the question/answer list" and to "follow sales to your customers closely."⁶¹ When customers asked for advice on how to clean up spills their advice was cursory as Monsanto "had no facilities for disposing of solid

⁵⁶ Donald Olson, Director of Sales, Functional Fluids Group to "Dear Sir," Feb. 9, 1970. [FN 116]

⁵⁷ Walter Schalk, Director of Sales, Plasticizers, to Dear Customer, Feb. 27, 1970.

⁵⁸ Wheeler et al to R. Harris, "Company Confidential... Report of Aroclor 'Ad Hoc' Committee," Second Draft, October 15, 1969. [FN 110]

⁵⁹ W. Richard to J. Mason, "Polychlorinated Biphenyls Research Summary," September 7, 1971.

⁶⁰ "Presentation to Field Sales" "Personal and Confidential," [Ca Feb. 16, 1970].

⁶¹ C. Paton to Brydon et. al., "PCB Publicity," February 16, 1970.

wastes...or liquids containing more than 1 % water.”⁶²

- a. In fact, there is evidence that even while providing “warnings” Monsanto internally admitted its goal was to downplay any risk so that the “warnings” would not affect sales. In Monsanto’s own words they took “reasonable action that will not unduely [sic] alarm the market but reduce the exposure in terms of liability.”⁶³ Monsanto’s plasticizer salesman were told to “minimize distribution [of information contained in a letter]. . . We want to minimize the effect of this letter. You should follow sales of Aroclor closely to monitor any effect . . . We want to continue selling all Aroclors – therefore play down the replacement bit and try to calm the customer.” The growing awareness of legal issues was on the minds of Monsanto executives. On the bottom of one handwritten memo were the words: “Nothing other than the letter from St. Louis should be put in writing to a customer on the PCB problem without clearance by our Law Depart...”⁶⁴ Aroclor sales had “increased every year for ten years” and Monsanto “wanted 1970 to be no different.”⁶⁵ And it wasn’t.

- XIV. A similar approach was taken with respect to Monsanto’s Pydraul customers. A memo was addressed to the company’s marketing staff to explain how to answer questions from customers who had learned of the public disclosures of the potential dangers of PCBs (and the decision to eliminate Aroclors 1254 and 1260 in Monsanto’s Pydraul products). The memo acknowledges that Monsanto “can’t afford to lose one dollar of business.” To that end, it says, “We want to avoid any situation where a customer wants to return fluid. . . . *The new reformulated products will be available within a month.* We would prefer that the customer use up his current inventory and purchase [new products] when available. He will then top off with the new fluid and eventually all Aroclor 1254 and Aroclor 1260 will be out of his system. We don’t want to take fluid back.”⁶⁶

⁶² W. Papageorge to D. Hansen, October 11, 1973; D. Wood to W. Papageorge, “GE Transformer Spill,” October 22, 1974; P. Gann to Robert Lowenstein, August 29, 1972.

⁶³ “Outline: PCB Environmental Pollution Plan,” Rough Draft, Nov. 10, 1969. [FN 90]

⁶⁴ Handwritten Memo from “C” [Cumming Paton] “Personal and Confidential,” Feb. 16, 1970. See also, “Presentation to Field Sales” “Personal and Confidential,” [Ca Feb. 16, 1970], p.3.: “Confidentially, our Legal Department believes this will minimize and, hopefully, eliminate claims made against us for environmental damage.”

⁶⁵ “Presentation to Field Sales” “Personal and Confidential,” [Ca Feb. 16, 1970].

⁶⁶ N.T. Johnson, St. Louis, “Pollution Letter,” Feb. 16, 1970. [FN 115]

- XV. As evidenced by multiple customer reactions, their warnings from the 1950s onward were insufficient for the recipients to fully understand the risks posed by PCBs.⁶⁷ One customer was “very bitter about Monsanto and really feel that we are ruining their reputation and company.”⁶⁸
- XVI. Even after reports were provided to Monsanto indicating their product had become a worldwide ecological contaminant (1966), Monsanto continued to promote and push the sale of its product for years until the public outcry was such that they could not continue the status quo. One company official had suggested they continue to “sell the hell out of ‘em.’”⁶⁹ Indeed, sales of PCBs increased every year from 1966 – 1970. In particular:
- a. When the contamination situation finally came to light in the US press (1968), Monsanto continued to misrepresent to the general public and regulators via letters and press releases that PCBs were not harmful and would not escape from purportedly closed systems. Monsanto also argued against a proposed ban on PCBs, pushed the EPA to relax their PCB discharge requirements with respect to Monsanto’s Anniston Alabama plant effluent, lobbied for more lax Federal requirements with respect to PCB discharges from production and using plants, and even (successfully) argued against FDA’s proposed more stringent regulations relating to PCBs in food, animal feed, food and feed processing plants and packaging materials based on a misleading claim about PCBs purported biodegradability.⁷⁰ Monsanto even commended employee Paul Wright--gave him a cash award--for his “prominent role in forestalling EPA’s promulgation of unrealistic regulations to limit discharges of polychlorinated biphenyls.”⁷¹

⁶⁷ “Salesman’s Call Report,” January 13, 1961; Joseph Allen to Monsanto, Att: Emmet Kelly, February 14, 1961 [FN 64]; J. E. Flynn to Monsanto, May 14, 1962; Emmet Kelly to File, “November 27, 1962; C. Paton to J. Brydon et al., February 16, 1970; “Personal and Confidential,” [Handwritten note], “PCB Publicity,” [about February 16, 1970]; C. Paton, “PCB Publicity,” March 31, 1970; Z. Obara to Monsanto, June 5, 1970; to Mr. D. Weisner, July 1, 1970; Papageorge to J. Mason, July 28, 1970; “Products Research & Chemical Corp., August 11, 1970; “Mrs. Paul’s Kitchen,” visit report, April 9 [1969?] [PCB -ARCH0483181]; Desoto, Inc., Chicago, May 7, 1971; T. Gosage to J. Fallon, “Therminol FR Fluid,” July 16, 1971; C. Paton to “Company Confidential,” Re: Product Liability, August 8, 1971 [PCB-ARCH0739360]; J. Roder to C. Paton, Trip Reports FR System, October 11, 1973.

⁶⁸ J. Roder to C. Paton, Trip Reports FR System, October 11, 1973.

⁶⁹ Handwritten Notes, PCB committee. Aug 25, 1969. [FN 106]

⁷⁰ D. Hosmer re: PCB Effluents from the Anniston Plant to Snow Creek,” Meeting at Southwest Regional Office of EPA, November 11, 1971; Paul Hodges, PCB’s – Allowable Discharge from Producing/Using Plants, “Minutes of Meeting – April 13, 1972 in EPA Offices, Washington D.C., ; Papageorge to Hearing Clerk, DHEW, July 14, 1972; Papageorge to K. Easley, “Environmental Impact Statement, PCB Rule Making,” January 4, 1973.

⁷¹ “Evaluation of Paul Wright,” July 16, 1976; Monsanto, “Achievement Award Data Sheet,” “Award Category,”

- b. Monsanto continued to sell PCBs for all uses up until 1970 when it purported to phase out “open uses,” such as plasticizer applications. However, Monsanto allowed their customers to stockpile PCBs such that 1970 was the biggest sale year for PCBs plasticizers in Monsanto’s history.⁷² Moreover, Monsanto continued to sell PCBs for CCP and for use as hydraulic fluids and heat transfer fluids, well after that date, despite the fact that these uses were effectively “open” to the environment as well. Monsanto went so far as to reuse reclaimed Aroclor in “new Pydraul hydraulic fluid,” an action that they knew would upset “pollution people.”⁷³
- c. And in the face of the public and regulatory community’s fear that PCBs were a risk to human health, Monsanto attempted to allay these fears and control the narrative regarding the academic studies that raised these concerns,⁷⁴ despite their knowledge internally that PCBs had been found in milk, fish, air, water and human fat.⁷⁵
- d. Monsanto executives were active in private regulatory bodies organized through industry. They promoted, Chaired and co-Chaired the “American National Standards Committee on Disposal of Askarel Used in Electrical Equipment,” the “new ANSI project” to “develop guides for the use and maintenance of askarel” and the “practical disposal procedures.”⁷⁶ Other companies turned to the

Nominee, Paul Wright,” February 1, 1976; Papageorge to Hearing Clerk, EPA, January 18, 1974; N.T. Johnson to Graska et al, Pollution Letter,” February 16, 1970, [FN 115]; Papageorge to K. Easley “Environmental Impact Statement, PCB Rule Making,” January 4, 1973; Papageorge to M. Sager, July 13, 1973; W. Clark, Visit with Nelson Rock, Amsco Salesman, July 27, 1970.

⁷² Visit Report to Willis Clark, “Amsco,” June 5, 1970; Visit Report, Koppers Research Center, July 23, 1970; W. Clark, Visit with W.R. Grace, October 15, 1970; “Aroclor Bulletin O/PL-306. April 3, 1970 PCB-ARCH0731281; To W.S. Clark, visit at Sonnenborn Building, June 3, 1970; J. Gannon to W. Clark, November 10, 1970; W.S. Clark, “W.R. Grace Construction Products, November 8, 197?;Schalk, “Aroclor Withdrawal/ Kopper Company,” January 31, 1972. [PCB-ARCH0030312]

⁷³ W. R. Richard to P. Benignus, “Disposal and Incineration of Aroclor,” April 14, 1969.

⁷⁴ Tom Ford to Jaffey, Wall Street Journal, June 13, 1969; “Statement from Monsanto Company, October 29, 1969 [111]; Press Release, “Monsanto Replies to Charge that PCB Threatens the Environment,” April 10, 1970 [FN 123]; J. Mason to William Ryan, April 28, 1970; J. McKee to Miami Herald, July 14 1970 [FN 133]; Papageorge, “PCB Environmental Problem, July Status Report,” August 18, 1970 [FN 134]; E. John, “November PR Report, November 30, 1970 [FN 146]; D. Bishop to H. Stevenson, UPI, December 6, 1979 [FN 229]; WGK Today, September 19, 1980 [FN 231]; “Note to Editors from Monsanto Company, PCB Hazard – Fact and Fallacies,” September 23, 1980. [FN 230]

⁷⁵ Keller to Papageorge, Personal and Confidential, “Environmental Materials Analyzed by Monsanto for PCBs,” April 17, 1970 [FN 124]; J. Mason to William Ryan, April 28, 1970; J. McKee to Miami Herald, July 14 1970. [FN 133]

⁷⁶ J.J. Kark to Donald Peyton, November 19, 1970; A.M. Salazar, Secretary, ANSI Committee, C107, to “Dear Sir,”

documents this group produced for guidance.⁷⁷ The Committee's "Transformer Working Group" learned of the high number of "Failure rates" for some leading companies.⁷⁸

- e. Their procedures for disposal of Askarel were suspect at best and primarily revolved around touting high temperature incinerators⁷⁹ and landfills. In 1971 a suggested method for disposing of Askarel included "drain out all dark, carbon-contaminated Askarel. (Discard by dumping or burying where it will not contaminate a water supply)."⁸⁰ Yet, they understood that millions of capacitors continued to be made, with PCBs deposited in "land-fills, all over the USA" and therefore posed threats to water supplies and local habitats. These landfills were used "as the disposal grounds."⁸¹ It was clear that landfills were very problematic. The EPA noted that "wastes containing PCBs should not be disposed of with other mixed waste in sanitary a landfill" and that only specially designed chemical waste landfill could be deemed adequate for the "long-term protection for the quality of surface and subsurface waters" that might be polluted by "hazardous waste deposited therein" and which can prove to be a threat to "public health and the environment."⁸² The most obvious sources of PCB fluids were acknowledged internally as major problems even as Monsanto reassured their customers that it could be disposed of safely. Monsanto was told by its own customers that "The problem of disposal of apparatus currently being retired ... is a large and real problem, not yet resolved."⁸³ Monsanto was aware that "the use of landfills for

May 1, 1970; P. Benignus, ANSI Committee C107, to W. Papageorge, March 8, 1973, ANSI Steering Committee C107, "PCBs – The electrical Industry," Agenda for December 1971 Meeting and Minutes of November 1971 Meeting," Nov. 18, 1971, "Steering Committee of ANSI C107," Attachment #1. [STLCOPCB4075320]; A. Salazar, ANSI, "To all Members of the special Working Groups,..." Nov. 18, 1971.

⁷⁷ J. McAllister to E. Burger, "Benefits of PCB Use", December 30, 1971.

⁷⁸ Minutes: Meeting of Capacitor AND Transformer Working Groups of ANSI Committee C107, On Use and Disposal of Askarel-Soaked Materials," December 15, 1971, p.3; ANSI Committee C107, "On Use and Disposal of Askarel Used in electrical Equipment," May 1, 1971, Attached. [NPC00006500]

⁷⁹ W. Papageorge to A. Posefsky, attachment: "PCB Questions and Answers for ANSI," February 2, 1972.

⁸⁰ J.G. Fredericksen to C. Paton, October 13, 1971. [STLCOPCB4102022]

⁸¹ P. Benignus to H. Bergen, "General Electric Capacitor Dept., Visit Oct. 25-26," October 26, 1971; R. Munch to P. Benignus, "NEMA Procedure to Eliminate Environmental Hazard Posed by Askarel," April 13, 1973. [PCB ARCH 0253341]

⁸² J. Weber to John Lehman, EPA, February 18, 1976, Attachment: "Recommended Procedures for the Disposal of PCB-Containing Wastes (Industrial Facilities)," p.9. [STLCOPCB4002375 - STLCOPCB40023756]

⁸³ Robert D. McClain to H. Wilbur Speicher, October 18, 1972.

disposal” was “the weakest part”⁸⁴ of their disposal plans but Monsanto’s Ralph Munch could “not suggest a better alternative.” Even “deep well disposal... should probably never be permitted.”⁸⁵ Yet, despite this foreboding, the ANSI committee that Monsanto led suggested that “it is the consensus that ... [PCBs] should be buried in a land-fill remote from lakes, streams or other sources of water.”⁸⁶ And Monsanto continued to publicly support the idea that landfills could be made safe because commercial incinerators were not up to the task. Initially, even Monsanto was hesitant to build their own and they noted in 1972 that there were none at all outside of the United States.⁸⁷

- f. There was no established method for disposing of PCB solid waste: “The problem of disposing of solid waste contaminated with polychlorinated biphenyls is indeed a perplexing one,” Papageorge admitted to Dupont’s Ralph Lee in 1972. “To my knowledge there are no incinerators available that are capable of reaching the high temperatures required..... [T]he costs relating to collection, transportation and destruction have, until now, presented serious obstacles toward the justification for the installation of an appropriate unit.”⁸⁸ Hence, “the only recourse available is the use of authorized, properly-managed dry landfills.” He argued that “it is our considered opinion that [if the landfill were dry] adverse effects to the environment will be essentially eliminated.”⁸⁹ Papageorge said, “To my knowledge the only practical method of disposal of solid waste containing PCBs is through burial in sanitary landfills.”⁹⁰
- g. Even when they offered customers the opportunity to return their product for incineration in their Krummrich plant they charged their customers at least 3 cents per pound. Nor would they accept PCB contaminated solids “such as sawdust, rags or sludge....” Monsanto suggested, instead, “checking with local authorities” for

⁸⁴ R.H. Munch to P. Benignus, “NEMA Procedure to Eliminate Environmental Hazard Posed by Askarel,” April 13, 1973. [PCB-ARCH0253341]

⁸⁵ *Id.*

⁸⁶ ANSI Steering Committee C107 Meeting, “PCBs – The Electrical Industry,” November 11, 1971, at p. 6. [STLCOPCB4075320]; Minutes: C-107 Capacitor Subcommittee Meeting, January 12-13, 1976.

⁸⁷ P. Benignus to D. A. Olson, “PCB Toxicity Problem Proper Disposal of Scrap Aroclor,” December 5, 1969; Papageorge to C. Paton, “PCB Disposal – Ex. U.S.,” February 10, 1972. [PCB-ARCH0064940]

⁸⁸ W. Papageorge to Ralph Lee, February 1, 1972, p. 449. [STLCOPCB4057215]

⁸⁹ W. Papageorge to Mary Appelhof, May 4, 1973.

⁹⁰ W. Papageorge to R. Rollins, December 5, 1975, p. 79: Papageorge Reading File. [STLCOPCB4049438]

an “approved disposal method.”⁹¹ Despite efforts to limit the amount of PCBs that accumulated at Krummrich, between 1971 and 1975 “15,237,000 pounds of PCBs” were burned and “510,000 pounds” were landfilled nearby. In addition, despite incomplete records, it is reported that more than 5.7 million pounds “were landfilled at the Monsanto Anniston Plant.”⁹² And, records show, as of January 1, 1974, of the 11,607,689 pounds of PCBs that had been returned to Monsanto, the company still had over 2 million pounds waiting to be incinerated.⁹³ In 1969 Monsanto hoped that up to 20 treatment facilities that would use a variety of methods including incineration to dispose of PCBs would be established.⁹⁴ But by 1975, W. Papageorge was writing to colleagues in other companies that he was “not aware of any company recognized by the EPA for handling equipment containing PCBs.”⁹⁵

- h. By the late 1970s, even Monsanto’s own incinerator needed upgrading to comply with the EPA’s new standards and Monsanto decided not to repair it.⁹⁶ In fact, the EPA determined that even the hoped-for relief of a high-temperature incinerator was not sufficient and by December 1979, the Agency warned that there were “no approved PCB incinerators available for commercial use in the United States,” a fact that Monsanto was aware of.⁹⁷ In the *Guidelines* from ANSI that Monsanto directed, the brief section on disposal of toxic and hazardous waste generally ignored the complexity of the issues outlined in internal correspondence, simply stating that liquid wastes should be incinerated at high temperatures and that “toxic and hazardous waste” could be placed in “certain landfill sites [which] have been classified by state governments and the federal government as suitable for the

⁹¹ W.N. Maddox to Mr. Laws, December 7, 1972; Paul Gann to J.L. , November 22, 1972; C. Paton to Dear Sir:, May 25, 1972.

⁹² “Item 5,” [MONS 049347]; See also, “Item 5 – Attachment B, “PCB Returns 1971”, 1971-1975, 1975. [TOWOLDMON0053061]

⁹³ J. Writson to R. Stovall, “Monthly PCB Status Report,” January 4, 1974. [STPCOPCB4081762]

⁹⁴ R. Kountz to N. T. Johnson et al, “Aroclor Waste Disposal,” December 8, 1969.

⁹⁵ W. Papageorge to R. Rollins, December 5, 1975, p. 79: Papageorge Reading File. [STLCOPCB4049438]

⁹⁶ RAP, “PCB Facilities Decontamination and Dismantlement Program,” November 3, 1977; “Questions and Answers to be Used Only to Respond to Direct Questions from the Media,” Second Draft Approved, November 4, 1977. [MONS 001869]

⁹⁷ EPA, Polychlorinated Biphenyls, An Alert for Food and Feed Facilities, “Important Notice: PCB Incinerators,” (Washington DC: GPO, December, 1979); R.L. Liss to E.J. Young, “PCB Disposal,” September 17, 1979, [PCB-ARCH0605768]; J. Craddock to R. Nelson, “February Monthly Report,” March 3, 1981, [PCB-ARCH0650797]; R.L. Liss and E.R. Condray, “EPA Manual for Enforcement of PCB Regulations,” May 11, 1978. [PCB-ARCH0741749]

disposal of toxic and hazardous liquids. Where such approval sites exist, they may be used for disposal of liquid wastes described in this standard.”⁹⁸ By 1976 ANSI noted that it had become “apparent that ANSI Publication C-107.1 (1974) was in need of updating.”⁹⁹ In that update, they planned to withdraw their recommendation for “landfilling liquids contaminated with PCBs.”¹⁰⁰ But as of Thanksgiving, the “final draft of revised guideline [was] stalled.... Apparently much confusion about effect of toxic substances and hazardous spills legislation on guidelines will delay issue considerably.”¹⁰¹

- i. The numerous sources of contamination from companies returning PCBs to Monsanto were noted by ANSI: “...PCBs and solids containing or contaminated with PCBs may be obtained from any of the following sources: transport containers, transformer manufacturing processes, in test failures, liquids contaminated beyond reclamation, in-service transformer leaks and failures, askarel-filled transformers scrapped for any reason, etc.”¹⁰² Even their own people remarked on the sloppiness with which companies shipped product back to them. In one such notice, Monsanto’s J.R. Savage wrote to C. Paton that Westinghouse did not “meet an acceptable standard,” and his message included photos of leakage of drums, loose drum covers, and floor sweepings in the bottom of drums.¹⁰³ Despite this knowledge, Monsanto distributed Q&A sheets that informed readers that “it should be emphasized that when properly handled, used and disposed of, PCB can be as safe to use as any other chemical – many of which are more dangerous than PCB.”¹⁰⁴ By December 1973, 11,607,689 pounds of PCB-containing products had been returned to Monsanto for incineration.¹⁰⁵
- j. By 1979, the unwillingness of Monsanto to participate in cleaning up the pollution

⁹⁸ American National Standard. Guidelines for Handling and Disposal of Capacitor and Transformer-Grade Askarel Containing Polychlorinated Biphenyls,” January 9, 1974, p.12. [STLCOPCB4066259]

⁹⁹ C.R. Willmore, To: All Members of ANSI Committee C-107 on Use and Disposal of Askarel – Soaked Materials in Electric Equipment,” September 24, 1976.

¹⁰⁰ M.C. Pierle to J. Weber, “PCBs – ANSI C-107” September 30, 1976. [PCB-ARCH0530403]

¹⁰¹ D. Wood to File, “Meeting with General Electric, November 10, 1976,” November 24, 1976.

¹⁰² “Guidelines for Handling and Disposal of Transformer-Grade Askarels, First Draft- For ANSI C-107 – April 3, 1972,” April 3, 1972.

¹⁰³ J.R. Savage to C. Paton, “Returned PCB – Westinghouse,” June 18, 1974. [PCB ARCH 0006855]

¹⁰⁴ “PCB Question and Answers for ANSI,” attached to Papageorge to Posefsky and E. Rabb, February 2, 1972.

¹⁰⁵ J. Wriston to R. Stovall, “Monthly PCB Status Report,” January 4, 1974. [PCB-ARCH0533871]

problem was noted by the EPA itself. In October, 1979, Roger Williams of the Regional EPA office in Denver wrote to Monsanto's President and Chairman of the Board, J.W. Hanley advising him of the impact of leaking drums of Therminol FR-1 had polluted a farm in his district and that tests of milk samples taken from a nursing mother "contained enough Aroclor to cause the Boulder County Health Department to recommend that she discontinue nursing her baby." The administrator found that the woman had "contacted Monsanto regarding the disposal of this product several years ago." The EPA administrator implored Monsanto to help clean up the area: "While Monsanto may not be legally liable for this clean-up effort, your company is responsible for having introduced this product into the marketplace. Accordingly, I feel that it is in the public interest that Monsanto assist in the clean-up effort...."¹⁰⁶ According to later correspondence, Monsanto provided the EPA "misleading" information, in part directing the EPA to contact Rollins Environmental Services which, in turn, refused to accept responsibility for the PCB-laden drums.¹⁰⁷

- k. Monsanto sought to shift responsibility to its customers for the safe disposal of PCBs.¹⁰⁸ In fact, by 1977, Monsanto stopped paying lip service to cleaning up PCBs in the environment. "Monsanto has no plans to initiate programs to physically remove PCBs from the environment," wrote E.T. Mollica. Specifically, "Monsanto has no intention of independently setting such a precedent." Further, Mollica wrote to their corporate official, F.J. Fitzgerald, "The EPA has proposed regulations for disposal of solid waste (i.e. capacitors) containing PCB, but we have no plans to underwrite the costs of that program."¹⁰⁹ Even with all the uncertainty and resistance to assuming responsibility for others' clean-up, Monsanto made arrangements for shipping its own waste to a private contractor who, according to its contract, had the "requisite expertise" to "dispose of [PCB

¹⁰⁶ Roger Williams, EPA Regional Administrator, to J.W. Hanley, President and Chairman, Monsanto, October 25, 1979. [PCB-ARCH0741981]

¹⁰⁷ Roger Williams to J. W. Hanley, December 3, 1979. [PCB-ARCH0741990]

¹⁰⁸ C. Paton to Haggart et. al., "PCB Disposal – ex USA," March 13, 1972, [STLCOPCB4051829]; R. Lucas to W. Papageorge, "PCB Disposal," August 8, 1974. [PCB ARCH0037471]

¹⁰⁹ E. T. Mollica to F.J. Fitzgerald, "PCB" November 10, 1977. [STLCOPCB4053215]

contaminated] ... waste in a safe and efficient manner.”¹¹⁰

- l. Finally, despite Monsanto’s claim that it ‘voluntarily’ got out of the business in 1977, it was the concerted efforts of environmental activists, regulators, and the media that forced Monsanto finally to make this decision because of its concern about the broad impact of the negative publicity on its image and ultimately its bottom line.¹¹¹ This included the pressure of government officials who, in the mid-70s identified PCBs as a “suspected carcinogen” and the EPA administrator, Russell Train, who called for meetings of Monsanto along with manufacturers of transformer and capacitors because of the growing concern over environmental and health effects of PCBs. As late as 1976 it was suspected that there were still an “estimated 500 million pounds of PCBs still in service.”¹¹²
- m. Internal documents during this time indicate that profits and retention of the market played a significant role in Monsanto’s decision to keep making PCBs for the electrical industry. Starting in 1972, when Japan banned PCBs for all uses including dielectric use, Monsanto recognized the need to have replacement products. Monsanto expressed concern that “the Japanese action of banning all PCB’s . . . may cause a political and emotional reaction both in the U.S. and abroad. We must explain why their reaction is different from ours. . . The Japanese announcement will add fuel to the fire that replacements are possible and . . . uneasiness will result. We must anticipate this and develop the plans to handle this situation.” Monsanto also expressed concern that its “special undertaking and the requirement for either \$50 million net worth or suitable insurance coverage will trigger the smaller manufacturers, in particular, to look for substitutes.” Therefore, it was concluded that “there is a distinct need for replacement products and we must let the industry know what we are doing about it and that we have some alternatives to offer them.”¹¹³ In the meantime, Monsanto continued to produce

¹¹⁰ “Waste Disposal Agreement” between Monsanto and Rollins Environmental Services, July 20, 1977; [Page 449 of “PCB Phase-Out” File. [STLCOPCB4057215]

¹¹¹ E. Kelly to Papageorge, March 30, 1970 [FN 120]; Memo for the Record, Subject: FJF Views on PCB’s, October 18 1975 [FN 219]; P. Wilkins, “Report by PCB Study Group, December 10, 1975 [FN 221]; D. Bishop, “EPA/PCB Press Conference,” December 22, 1975. [FN 213]

¹¹² Meeting Minutes of ANSI Committee, C107, “On Use and Disposal of Askarel and Askarel-Soaked Materials,” January 12, 1976, “General Discussion and Background Information.”

¹¹³ H.S. Bergen to R. H. Munch, “Dielectric fluids Strategy,” April 3, 1972. See also, “Dielectrics Product Summary

PCB products for some domestic uses and foreign markets. In July, 1975, David Wood reported that 3204 metric tons of Aroclor 1242 and 3746 metric tons of Aroclor 1254 had been produced in the OECD, as well as 37.09 metric tons of Aroclor 1221.¹¹⁴ Estimates by Monsanto Europe's Bletchley held that the problem of disposal would continue to worsen, increasing throughout the 1980s and peaking "in the period 1995/99 in Europe and North America, and in 1990-94 in Japan...."¹¹⁵

- n. In its 1973 Long Range Plan Dielectrics, Monsanto again expressed concern that "Japan has banned PCB's, which has caused some U.S. demand for non-PCB capacitors for equipment for export to Japan" and that this "could result in establishing feasibility of non-PCB dielectrics, which would erode our position." As to Monsanto's possible substitutes, "our own new dielectrics are promising, but 1-2 years will be required to prove their utility and profitability and volume required." Monsanto's stated objective as to Aroclors was to "1. retain M/I of 95-100% U.S., 100% U.K., 30% Europe. Gross profit 35% worldwide. 2. Support dominance of Aroclor as major dielectric fluid through 1975. [and] 3. In new non-PCB dielectrics, achieve at least 50% M/I domestically through 1976."¹¹⁶
- o. Monsanto's PCB Contingency Plan of July 1975 analyzed various scenarios including if PCBs were banned and whether Monsanto's non-PCB products would be acceptable to the industry. Case 1 "Government ban effective 1/1/76" was deemed to be the "worst economically for Monsanto [. . . because] there is very little chance of our successfully developing a transformer replacement product in this case."¹¹⁷
- p. Monsanto in its PCB Position Paper from November of 1975 calculated the financial impact "should we precipitously terminate PCB sales" as "\$18 [million] in yearly sales and \$6 [million] in yearly gross profit, worldwide. Phase-out and

and Market Outlook," "Company Confidential," 1973 [STLCOPCB4065227] "We came through 1972 better than expected..."

¹¹⁴ D. Wood to J. Buchanan, with "Latest Information Supplied to OECD on PCBs," attached, July 14, 1975. [STLOPCB4072629]

¹¹⁵ J.D. Bletchley, "Polychlorinated Biphenyls – Production, Current Use and Possible Rates of Future Disposal in OECD Member Countries," [ca. 1983]. [PCB-ARCH-EXT0016689]

¹¹⁶ "Long Range Plan: Dielectrics," 1973.

¹¹⁷ Bergen to Seval, July 23, 1975, "PCB Contingency Plan"; "Discussion of Case 1." [MONS 058543]

write-off costs are estimated to be \$2.6 [million]. Additionally, the potentially [sic] loss to other Monsanto biphenyl-related products would be another \$15 [million] in annual sales and \$5-6 [million] in annual gross profit.” It was discussed that “our capacitor customers have non-PCB options available to them . . . [and] [o]ur transformer customers could relax fire resistance considerations and substitute mineral oil or high flash point silicones instead of PCB’s.”¹¹⁸

- q. Monsanto’s stated “options in the absence of an immediate governmental ban can generally be viewed as three: (1) continued PCB sales until either legislation prohibits sale or our customers abandon the product; (2) cease production precipitously; or (3) a planned replacement with non-PCB dielectrics which satisfy our customers performance needs and allows Monsanto to maintain most of our existing market.” After determining that option 1 “is probably unrealistic in light of the growing political environment surrounding PCB’s and [because] Monsanto would be considered irresponsible by our critics,” and after analyzing the negative consequences of option 2, Monsanto chose option 3. In particular, the plan was to develop a “feasible replacement of PCB’s with non-PCB alternatives made by Monsanto which satisfy our customers’ needs and protects most of our existing market position and profitability.”¹¹⁹
- r. In December of 1975, Monsanto believed it had come up with an acceptable non-PCB alternative for capacitors. However, Monsanto’s substitute replacement product was determined to be unacceptable by March/April of that year and industry had decided to go with other alternatives. In particular it was determined that “G.E. can make acceptable capacitors with Phthalate Ester (DOP) to serve all markets . . .”¹²⁰ As to transformers, Monsanto had “developed the best replacement candidate [it] could” but it had “showed less fire resistance . . . even compared to silicone.” So industry decided to go with “straight trichlorobenzene,” “liquid silicone” and by “specifying air-cooled or oil-cooled units.”¹²¹ After determining that “PCB sales for new units are now projected to be near zero by

¹¹⁸ “Monsanto PCB Position Paper,” Nov. 13, 1975.

¹¹⁹ “Monsanto PCB Position Paper,” Nov. 13, 1975.

¹²⁰ “Dielectrics: Business Direction,” Ca. early 1976.

¹²¹ “Dielectrics: Business Direction,” Ca. early 1976.

early 1977,” Monsanto decided to: “1. Cease all work on formulation of non-PCB replacement transformer fluids. 2. Redeploy our resources to growth projects. [and] 3. Reaffirm Monsanto’s PCB withdrawal.”¹²²

- s. The decision was summarized as follows: “1. We are getting the corporation out of the production of an environmental pollutant. 2. We are exiting the business profitably while veering all our phase out costs. 3. We have prevented what would have been we believe, a serious capital mistake.”¹²³

XVII. Monsanto and its predecessor invented and created the market for PCBs and promoted their use because it was profitable. Monsanto introduced PCBs into the stream of commerce, the environment, and our bodies before making any effort to determine whether they were safe for humans in the event of long term exposure. As recently as the 1930s, PCBs were in none of us, but today PCBs are documented to be in literally all of us. Monsanto was the sole manufacturer of PCBs in the US. Monsanto’s business decisions, which as set forth above, were in violation of industry and their own product stewardship standards, have created a situation where every person is contaminated with a chemical that is a risk to human health.

We reserve the right to amend or supplement this report based on additional data or information we receive.

¹²² “Dielectrics: Business Direction,” Ca. early 1976.

¹²³ “Dielectrics: Business Direction,” Ca. early 1976; PCB Q&A, September 24, 1976.

EXHIBIT A



ORIGINAL ARTICLE

Monsanto, PCBs, and the creation of a “world-wide ecological problem”

Gerald Markowitz^{1,2} · David Rosner^{2,3}

Published online: 7 November 2018
© The Author(s) 2018

Abstract For the past three decades, we have written on the history of occupational and environmental health, authoring books and articles on lead poisoning, silicosis, asbestosis, and angiosarcoma of the liver, among other diseases. One book, *Deceit and Denial*, focused specifically on the chemical and lead industries. Because of the rarity of historians who study this history, we have been asked to testify on behalf of workers who allege harm from these industrial materials and by state, county, and local governments who seek redress for environmental damages and funds to prevent future harm to children. In about 2010, we began testifying in law suits brought by individuals who claimed that they had suffered from cancers, specifically non-Hodgkin’s lymphoma, because of polychlorinated biphenyls (PCBs) in their bodies. At that time, we wrote a Report to the Court about industry knowledge of the dangers of PCBs to workers and the environment. More recently, we have been approached by attorneys representing government agencies on the West Coast of the United States which are seeking funds to abate PCB pollution in their ports, bays, and waterways. The focus of these lawsuits is the Monsanto Corporation, the sole producer of PCBs in the United States from the 1930s through 1977. Through these law suits, an enormous trove of previously private Monsanto reports, papers, memos, letters, and studies have been made available to us and this paper is

See also, Special Section: ToxicDocs: Opening a new era of evidence for policies to protect public health in J Public Health Pol (2018) 39:1 at <https://link.springer.com/article/10.1057/s41271-017-0102-z>, starting with an explanation of the www.ToxicDocs.org website and its many uses.

✉ David Rosner
dr289@columbia.edu

¹ John Jay College and Graduate Center, City University of New York, New York, NY, USA

² Mailman School of Public Health, Center for the History & Ethics of Public Health, Columbia University, 722 West 168th Street Room 935, New York, NY 10032, USA

³ Department of History, Columbia University, New York, NY, USA



the result of our examination of these hundreds of thousands of pages. The documents from this collection (with the exception of privileged materials that Monsanto has not made public, and upon which we have not relied) are available on www.ToxicDocs.org, the website we have developed with Professor Merlin Chowkwanyun of Columbia's Mailman School of Public Health. (Almost all of the references that are from this collection can be accessed by readers by clicking on the reference hyperlink.) This monograph is adapted from a report to the court that was originally produced for litigation on behalf of plaintiffs in PCB lawsuits. We are grateful to the *Journal of Public Health Policy* for publishing this detailed examination of these documents and we hope it will stimulate further research into this important, and now public, archive of industry records.

Keywords Monsanto · PCBs · Pollution · Cancer · Industry · Chemicals · Public health

Introduction

Industrially produced chemicals have become an essential ingredient in virtually all of our lives. Our kitchens are filled with detergents; household sprays are made from a variety of solvents; our walls and floors are made of 'vinyl'; our foods are packaged in wrappings made of clear plastics; our vegetables are grown with synthetic fertilizers and covered with pesticides; our computers, desks, and mechanical devices are filled with synthetic materials. It is not surprising that chemicals are in our bodies as well, where literally hundreds of chemicals have been identified.

Scientists barely understand what long-term dangers these substances may present to human health and the environment. Some of these chemicals are especially worrisome: bisphenol a (BPA) used as a plasticizer in hundreds of products from the lining of canned food to the receipts we receive for our credit card payments, is a known endocrine disruptor. Formaldehyde, a colorless chemical used in mortuaries as a preservative, can also be found as a fungicide, germicide, and disinfectant in, for example, plywood, particle board, hardwood paneling, and the "medium density fiberboard" commonly used for the fronts of drawers and cabinets or the tops of furniture [1].

As these materials age, formaldehyde evaporates into the home releasing a cancer-producing vapor, that slowly accumulates in our bodies. The National Cancer Institute (NCI) at the United States (US) National Institutes of Health (NIH) suggests that homeowners "purchasing pressed-wood products, including building material, cabinetry, and furniture... should ask about the formaldehyde content of these products." Flame retardants commonly used in sofas, chairs, carpets, love seats, curtains, baby products, and even TVs, which sounded like a good idea when widely introduced in the 1970s, turn out to pose hidden dangers that we're only now beginning to grasp [2]. Researchers have, for instance, linked one of the most common flame retardants—polybrominated diphenyl ethers—to a wide variety of potentially undesirable health effects, including thyroid disruption, memory and learning



problems, delayed mental and physical development, lower IQ, and the early onset of puberty. (This introduction is drawn from: Gerald Markowitz and David Rosner, “Your Body is a Corporate Test Tube,” *Tom Dispatch*, April 28, 2013, available at: <http://www.tomdispatch.com/blog/175693/>.)

Of special concern are a variety of chlorinated hydrocarbons, including DDT and other pesticides that were once spread freely across the United States. Despite being banned decades ago, they have accumulated in the bones, brains, and fatty tissue of virtually all of us. Their close chemical carcinogenic cousins, polychlorinated biphenyls (PCBs), were found in innumerable household and consumer products—like carbonless copy paper, adhesives, paints, and electrical equipment—from the 1950s through the 1970s. We are still paying the price for that industrial binge today, as these odorless, tasteless compounds have become persistent pollutants in the natural environment and, as a result, in all of us.

A case study of PCBs (1930s–1970s) begins to answer broader questions

How did we get into a situation where we only try to remedy a problem after the horse has left the stable? How did we learn to accept the introduction of thousands of chemicals into the environment and into our bodies before knowing they were safe? This case study of PCBs begins to answer those questions. Here we will outline the history of a material that was as recently as the 1930s in none of us but which today is documented to be literally in all of us. The brief story is that PCBs were invented, found to be useful, and to be profitable to one company, Monsanto, which had a monopoly in the United States and was distributing it widely before most Americans had ever heard of it. By the time it was banned in the late 1970s, it was already a worldwide environmental pollutant and part of our bodies.

The presence of PCBs in our bodies is often presented as data, and thus implicitly, an inevitable product of the development of an industrial society. In this review of the history of this universal pollutant, we can discern a different narrative of decisions and interests that overcame good judgement. Although Monsanto has argued that PCBs were placed in closed systems that posed little risk of contamination of the broader environment, this study reveals that from virtually the very first moments of PCBs manufacture in the 1930s, PCBs were envisioned as ingredients in a wide variety of products that ultimately would be used, handled, and consumed in ways that would make it virtually inevitable that they would enter the environment and into human bodies [3]. Further, this article demonstrates that despite commitments of United States (US) industries, Monsanto included, to fully test substances and products that were widely distributed, and despite the fact that such testing was conducted by many companies including Monsanto, the company never did long-term evaluations of this product until 1969, and only after others had already found it to be a world-wide ecological contaminant. The company’s initial reaction to the others’ discovery of the universal presence of PCBs in the environment and in human beings was not to reduce the production of PCBs designed for ‘open’ applications, but to increase production and, in the words of one company official, to “sell the hell out of ‘em.”



Despite Monsanto's claim that it 'voluntarily' got out of the business in 1977, it was the concerted efforts of environmental activists, regulators, and the media that forced Monsanto finally to make this decision because of its concern about the broad impact of the negative publicity on its image and ultimately its bottom line. Parts of this story have been told in Ellen Spears's excellent book, *Baptized in PCBs—Race, Pollution and Justice in an All-American Town*, a close examination of the impact of Monsanto on Anniston, Alabama, the site of much of its PCB production [4].

Although Spears presents some of this story in her book, we provide a broader and more detailed examination of Monsanto's PCB story based on documents not available at the time of the publication of her book.

PCBs and early warnings of danger, 1933–1949

Chlorinated naphthalenes and diphenyls are in general highly toxic compounds and must be used with extreme care. Industrial hygienists should make every effort to see that such exposures are controlled, insofar as humanly possible. In this effort, we do not believe it safe to rely on limiting atmospheric concentrations but rather to depend on a maximum of maintenance and engineering control. Leonard Greenburg [5]

Just as the country was entering the Great Depression of the 1930s, the Swann Chemical Company of Anniston, Alabama, began producing PCBs. Within a few years, it became clear that PCBs were systemic poisons. This section describes the early history and initial uses of PCBs as well as the early recognition that chemical workers exposed to chlorinated diphenyls developed chloracne, a serious skin condition, and liver abnormalities.

Monsanto acquired a majority of Swann's shares in 1933 and bought the company outright in 1935 [6]. From the very first, Monsanto understood that PCBs would be used in transformers and capacitors as well as a wide variety of products that would enter the stream of commerce, and therefore, the environment. These chlorinated diphenyls had a variety of attractive qualities for industry: they had high boiling points and were touted for their "non-flammability," they had high dielectric constant and resistivity, they were insoluble in water, the resins adhered strongly to glass and metal, and they did not oxidize in air, among other qualities [7]. PCBs were designed to be resistant to chemicals, heat, water, and to be virtually indestructible. According to a list of use codes for which PCBs were intended, PCBs were designed to be used in electrical insulation; flameproofers; paints; varnishes; adhesives; lacquers; transparent and moisture proof paper; heat transfer; impregnation; delustering rayon; plasticizers; fireproofing cloth; ink; lubrication; temperature control equipment; and chewing gum [8]. The PCB industry flourished as the New Deal national electrification projects and World War II industrial mobilization led to a booming market for insulating materials for transformers and capacitors.

Almost from the start of large-scale commercial production, there was evidence that PCBs caused harm to workers. They developed a serious dermatitis, chloracne, a condition defined by disfiguring pustules and blackheads. Initially



Swann Manufacturing believed that the men were over-exposed to dust and fumes from the heated Aroclors—the trade name of the commercial PCB mixtures manufactured by Swann (and then Monsanto) because of inadequate ventilation. They noted that when diphenyl was chlorinated it produced a very unstable compound which gave up hydrochloric acid. It was assumed that the Aroclor vapor entered the pores of the skin along with styrene dichloride. “The acid formed acted as an irritant, infection set in, and the skin disease resulted” [9].

As a result, in 1933 Swann contracted with Dr. Frederick Flinn of Columbia University to investigate “whether or not the various chlorinated diphenyl compounds submitted or some impurities contained therein might be the causative agent producing the dermatitis which had developed among some of the workmen in the plant.” Flinn suspected that styrene might be the source for the problem and that “means be provided for the men to take a bath with soap and water if they come in contact with the type of material found to be positive.” Flinn told the company that “if a leak or spillage occur[ed] the immediate bathing under these circumstances should be insisted on” [10]. After Monsanto acquired Swann, it was the sole producer of this product in the United States. By 1970, PCBs were manufactured by Prodelee in France, (called Phenochlor), and Bayer in Germany (called Colphen). Other manufacturers were located in Japan and the Soviet Union [11]. By 1970, “the market has grown to one of Monsanto’s most profitable franchises” [12].

Cecil Drinker, professor of public health and medicine and Dean of Public Health at Harvard University, followed up on these and other reports producing an article entitled “The Problem of Possible Systemic Effects from Certain Chlorinated Hydrocarbons,” which appeared in *The Journal of Industrial Hygiene and Toxicology* in September 1937. The article, first presented at a one-day “Symposium on Certain Chlorinated Hydrocarbons” at the Harvard School of Public Health, noted the growing use of PCBs in electrical equipment and the worrisome implications of widespread dispersal of this material. Drinker observed that there was a “large literature” on the “troublesome acne” caused by PCBs but his concern was “with the possibility of systemic effects following ingestion or inhalation of such products.” The previous year (1936), he pointed out, the Halowax Corporation, which was a division of the Bakelite Corporation, experienced “three fatal cases of jaundice in workmen using chlorinated naphthalenes and chlorinated diphenyl, and requested that the subject be investigated as rapidly and thoroughly as possible.” Drinker noted that there was a “meager literature upon systemic effects from these substances.” By that time there had been mention of “acute yellow atrophy” by Flinn and Jarvik and “serious liver injury” from the “most highly chlorinated of those [compounds] tested.” He believed that the very high dosage meant that these results did not “apply directly to human exposure.” Drinker noted that this earlier evidence of possible danger was “sufficient to indicate that compounds more highly chlorinated than trichlor naphthalene are capable of causing liver injury when inhaled steadily in quite low concentrations.” While he saw no sign of injury to other organs, the chlorinated diphenyl is certainly capable of doing harm “in very low concentrations and is probably the most dangerous.” He worried that constant exposure could lead workers to



acquire a substratum of liver damage upon which acute yellow atrophy may develop. Experience in a number of plants has shown how easy it is to reduce concentrations of these compounds practically to the vanishing point, and every effort should be made to attain such conditions.

He concluded that “These experiments leave no doubt as to the possibility of systemic effects from the chlorinated naphthalenes and chlorinated diphenyl. As in the case of the effects upon the skin, the degree of chlorination seems to determine the systemic toxicity.” Drinker recommended industrial hygiene and engineering controls to deal with the problem: “the solution consists in thoroughly adequate ventilation plus good housekeeping around all wax containers” [13].

Drinker’s paper was followed by a long discussion by representatives of Monsanto, the Halowax Corporation, General Electric and others of the chlorinated naphthalenes and diphenyls and their production and use. Dr. Albert Gray, Director of the Bureau of Occupational Diseases in the Connecticut Department of Health, announced that he too had found a number of these cases in his state [14].

Sandford Brown, the President of the Halowax Corporation, discussed the economics of occupational disease research and the calculus that manufacturers went through in deciding whether or not to test their products for possible toxicity. “The problem so far as the chemical manufacturer is concerned is a question of timing.... Should we take a product of which you have developed, say, 5 or 10 gm. and spend \$50,000 on research to determine whether or not it is toxic or should you wait until you have determined whether you have a market for it?” he asked. “If you are producing only one hundred substances a year you can see that that would run into box car numbers in the way of dollars and cents until you ever sold any.” This general problem of how to evaluate the relative costs and benefits of toxicological research was relevant to the issue of Halowax and chlorinated diphenyls more generally. Halowax “has been on the market for 25 years. Until within the past 4 or 5 years there has never been any intimation that it would cause any systemic effects.... Then we come to the higher stages, combined with chlorinated diphenyl and other products, and suddenly this problem is presented to us” [15].

General Electric’s representative, F.R. Kaimer, described in 1937 the human costs of exposure to chlorinated naphthalenes and diphenyls: It was “only 1½ years ago that we had in the neighborhood 50–60 men afflicted with various degrees of this acne about which you all know,” he reported. “Eight or ten of them were very severely afflicted—horrible specimens as far as their skin condition was concerned. One man died and the diagnosis may have attributed his death to exposure to Halowax vapors but we are not sure of that.” Kaimer told of the company’s initial human reaction to this tragedy in the plant: “The first reaction that several of our executives had was to throw it out—get it out of our plant. They didn’t want anything like that for treating wire.” The reality of running an electrical company overwhelmed the humanitarian instincts of the executives. “That was easily said but not so easily done,” he explained. “We might just as well have thrown our business to the four winds and said, ‘we’ll close up,’ because there was no substitute and there is none today in spite of all the efforts



we have made through our own research laboratories to find one.” They began working on remodeling the plant and instituting hygienic precautions in order to reduce exposure of the workforce to the chemicals.

With the adequate ventilation system we have installed, with the routine for change of clothing from street clothing to work clothing when they come to work and the reverse of that process, with the assurance that a shower will be taken before the street clothing is again put on, we have found no recurrence of this skin trouble [16].

Near the end of the conference, R. Emmet Kelly, who would later become the Medical Director of Monsanto, spoke on behalf of the company. As the sole producer of chlorinated diphenyls in the United States, the company did not have much to contribute vis a vis toxicological studies, “but there has been quite a little human experimentation in the last several years, especially at our plants where we have been manufacturing this chlorinated diphenyl.” He spoke of “a more or less extensive series of skin eruptions which we were never able to attribute to as cause, whether it was impurity in the benzene we were using or to the chlorinated diphenyl,” but “never had any systemic reactions at all in our men. We have examined them very closely both from what laboratory tests we thought might help us and from the clinical viewpoint. Also, from chlorinated diphenyl alone there have been no cases of systemic poisoning reported” [17].

Following the publication of Cecil Drinker’s article, other private internal company communications alerted Monsanto to the toxicity of the chlorinated biphenyls that the company was producing. In October 1937, L.A. Watt, a Monsanto official, wrote that “Experimental work in animals shows that prolonged exposure to Aroclor vapors evolved at high temperatures or by repeated oral ingestion will lead to systemic toxic effects.” He also worried that “Repeated bodily contact with the liquid Aroclors may lead to an acne-form skin eruption,” and called for “Suitable draft ventilation to control the vapors evolved at elevated temperatures, as well as protection by suitable garments from extensive bodily contact with liquid Aroclors, should prevent any untoward effect” [18].

The next year Cecil Drinker wrote a private “Report to the Monsanto Chemical Company” that pointed out that some chlorinated biphenyl compounds were “so definitely toxic” at “such low concentration[s]” that “It seems imperative that whenever this compound is used in industry, great care be taken to keep concentrations in the air at an extremely low level. No liberties can be taken with it...” [19]. In 1939, Drinker published a new article in the *Journal of Industrial Hygiene and Toxicology* correcting an earlier statement that one of the substances that he had identified as a chlorinated diphenyl was, in fact, “a mixture of chlorinated diphenyl and chlorinated diphenyl benzene.” In Table 1 of the article, he listed fourteen chlorinated hydrocarbons and his suggested permissible exposure limits. The ninth substance was listed as chlorinated diphenyl and had the lowest “permissible limit” of 0.5 mg per cubic meter [20].

During World War II, New York State’s Division of Industrial Hygiene “conducted an investigation in two cable plants using chlorinated naphthalenes and diphenyls.” What they found were “many cases of dermatitis ... and several



deaths due to liver damage among workers in the industry.” Their study concluded that “Chlorinated naphthalenes and diphenyls are in general highly toxic compounds and must be used with extreme care.” And they suggested that “every effort” had to be taken to assure “that such exposures are controlled, insofar as humanly possible.” Specifically, they suggested that companies “depend on a maximum of maintenance and engineering control” because they did “not believe it safe to rely on limiting atmospheric concentrations” [5].

By 1944, Monsanto was warning its salesmen about the dangers of Aroclor. In its Salesmen’s Manual, the company warned that “All chlorinated hydrocarbons have measurable degrees of toxicity to the animal organism. Aroclors are no exception.” They listed both topical and systemic symptoms as well as acute and subacute effects of exposure to PCBs. Chloracne was “a result of insufficient cleansing of the skin” while “acute yellow atrophy of the liver” was “a result of extensive exposure over long periods of time.” Among the chlorinated hydrocarbons that could produce such symptoms were as follows: “Carbon tetrachloride, dichlor-ethylene, trichlor ethylene, chlorinated naphthalene (Halowax).” The Manual said that “The foremen of all departments where this material is handled should be apprised of the toxic nature of the material and instructed in safe handling procedures.” It also recommended pre-employment and periodic physical exams, skin examinations, reliable liver function tests, and immediate medical checkups when workers developed Gastro-intestinal complaints” [21].

By 1949, the dangers of Aroclor and Halowax were noted in a major industrial toxicology text:

Systemic poisoning from these chlorinated substances usually follows the inhalation of fume rather than from the handling of the dry hydrocarbon waxes. Damage is severe, and occasionally fatal. Acute yellow atrophy of the liver is generally associated with serious exposure to the chlorinated naphthalenes and diphenyl fumes. Three fatalities were reported in 1936–1937. In 1939, three additional cases were reported by Greenburg, Mayers, and Smith and a further case by Collier in 1943. While acne may be taken as a warning sign in workers handling this material it is not invariably present and systemic poisoning may occur in the absence of this sign [22].

Also during 1949 an employee at Monsanto’s British affiliate, Monsanto Chemicals Limited, reported that the company had only published one technical service bulletin on Aroclors that acknowledged the toxicity of the substance. That bulletin stated: “Prolonged exposure to Aroclor vapours will lead to systemic toxic effects. However, this is not significant except at high temperatures and then normal draught ventilation will remove any risk.” The bulletin also stated that “Acne-form skin eruptions may arise from continued bodily contact with liquid Aroclors, but normal precautions and, if necessary, suitable garments provide adequate protection.” The bulletin said that it was unlikely that workers would ingest enough Aroclor for serious harm [23].

Also, in 1938 Monsanto began paying serious attention to one of the attractive qualities of PCBs: their persistence. They set up a test site on the campus of the



University of Florida at Gainesville where they deposited Aroclors 1242, 1248, and 1254 [24].

Industry’s commitment to workers and the public: research and warnings in the 1940s

In an era before the establishment of federal health and safety agencies like the Occupational Safety and Health Administration in 1970, industry argued that they, not the government, had the responsibility for not only maintaining a safe workplace but also for identifying dangers their products posed for both the workforce and consumers. This section will outline the development of these industrial principles. Two trade associations of which Monsanto was a member, the Manufacturing Chemists Association (MCA) which represented all major chemical companies in the country, and the Industrial Hygiene Foundation (IHF), the leading health-focused industrial trade group in the United States, were leading proponents of these principles. In 1939, the MCA stated: “The manufacturer or one who holds himself out to be the manufacturer must know the qualities of his product,” and further, the “manufacturer cannot escape liability on the ground that he did not know it to be dangerous.” The MCA also wrote, “a manufacturer who puts out a dangerous article or substance without accompanying it with a warning as to its dangerous properties is ordinarily liable for any damage which results from such failure to warn” [25]. In 1945, the MCA incorporated these principles in its “L-1 Manual,” “A Guide for the Preparation of Warning Labels for Hazardous Chemicals” [26, 27].

The IHF made similar statements of principle in the 1940s. Francis Holden, the chief industrial hygienist for the foundation stated in 1942:

Every new chemical or product should be investigated as to its toxicity before it is prepared in large amounts and released to the public. This practical common-sense procedure is followed by several larger producers of synthetic chemicals. At least two of the companies are members of the Foundation and can furnish details of their experience to other interested members [28].

Henry F. Smyth, a toxicologist with Union Carbide and the Mellon Institute—the research arm of the IHF, summarized the consensus of major industrial leaders on companies’ responsibilities when confronted with potentially dangerous substances: “It is clearly the duty of a manufacturer to delay production of a chemical until the health hazards are well enough defined so that protection of his workmen is possible.” This was the “responsibility of industry”. He suggested that when a product was being developed initially, it was appropriate to first do a quick test, but if the material was going to be produced in large quantities, then the company needed to “perform more detailed studies” [29].

It is clear that Monsanto understood its responsibilities to consumers. In 1947, Monsanto’s Medical Director, Emmet Kelly, spoke to the American Public Health Association about the importance of industrial medicine and industrial hygiene. In a news release about that address that Monsanto prepared, it said, “Although many new products are being developed by manufacturers, the problem is to make certain



that no new chemical is used in a manner in which systemic toxicity or skin irritation might result either in workers making the product or in consumers” [30]. In fact, in 1957, Jack Garrett, Monsanto’s industrial hygienist (who would later become manager of Pollution Abatement and Industrial Hygiene at the company), published an article in *Industrial Wastes* in which he identified the responsibilities of companies to test their products for danger to humans and the environment:

When a new product is to be manufactured it behooves the manufacturing plant to determine the effect, if any, of the waste products on the receiving stream. The determinations should answer the following questions: 1. Will the effluent, as discharged, adversely affect human life? 2. Will the effluent, as discharged, adversely affect aquatic life? The effects referred to here are of a more insidious nature. What, for example, would be the long term effects on human life of drinking water containing X concentration of a certain compound over a period of many years?

He specifically addressed the importance of doing “chronic toxicity” studies to know what the long-term effects of materials may be [31].

In fact, by the 1940s there were hundreds of chemicals that had been tested for cancer and numerous studies were undertaken to evaluate the cancer risks in industry. Wilhelm Hueper, the former medical director of Dupont, published in 1942 *Occupational Tumors and Allied Diseases*, a massive 800-page text reviewing these studies [32]. In addition, the National Cancer Institute which Hueper would soon join, surveyed the literature of the potential carcinogenic properties of 696 chemicals, 169 of which were reported to be potential carcinogens. Their survey was summarized in the IHF’s *Industrial Hygiene Digest*, and sent to all its members [33].

New uses for PCBs in the post-war era: environmental contamination and systemic toxicity in the 1950s

While PCBs were already used in the emerging electrical industry, Monsanto found other potential markets for its product. This section explores the variety of industrial and consumer products that PCBs found their way into, most of which could and did become environmental pollutants. In addition, it explores the growing worry that PCBs were a potential cause of systemic disease in humans.

The end of World War II marked the end of a long period of austerity for most Americans. For 15 years (1930–1945), the consumer economy had been at a virtual standstill as economic Depression, combined with the focus on war production continued to stymie consumer demand. But that was about to end as the United States experienced a sustained period of economic growth (1945–1970). This demand was seized upon by chemical and electrical manufacturers, in particular, who claimed that Americans would experience “Better Living Through Chemistry” and that “Progress Is Our Most Important Product.” In 1946, Monsanto joined in running a full page color ad in the *Saturday Evening Post*, one of the nation’s leading mass circulation magazines, that detailed to readers the numerous materials and consumer



products that contained their PCBs. These included shower curtains, paints, varnishes, adhesives, rubber finishes, and others [34]. During the 1950s, Monsanto expanded its use of PCBs to carbonless carbon paper, and indirect heating systems for fried foods, uses that could and did get into the open environment.

Also, in the 1940s and 50s, Monsanto was a manufacturer of DDT, under the trade name “Santobane.” In 1951, in “A Guide for Formulating Santobane, Monsanto, DDT,” Monsanto suggested that PCBs be used as a solvent with Santobane [35]. Other Monsanto documents indicate that PCBs were recommended or used as either pesticide extenders or as pesticides themselves. In June 1955, P.G. Benignus, the director of development for Monsanto, wrote in his technical sales report that “field tests with Aroclor in the insecticidal field are under way in about 12 locations, including Florida, Oregon, Texas, Maine, Mississippi.” He pointed out the widespread use of Aroclors as pesticide extenders, arguing that “The people at Beltsville [at the Department of Agriculture] seemed to appreciate it when we mentioned that we have sold truckload amounts of Aroclor for use in combination with Lindane and other insecticides. Evidently they were not aware that their work has led to commercial value” [36].

As the use of PCBs in pesticides expanded in the mid-1950s, one Monsanto scientist (L. W. Sherwood) warned the Development Department of the company of the potential problems this could cause. In a memo to Benignus, he cautioned his colleague about this use of Aroclor.

It is most surprising to see that you are recommending without restriction a use for Aroclor which has not been approved by U.S.D.A.-F.D.A. [United States Department of Agriculture-Food and Drug Administration]... You may already know that since Aroclors are toxic and, according to your attached reference, may extend the residual life of the pesticide, the Federal government would require the following before selling for use on food and feed crops: 1) Proof of benefits for the application. 2) Data to show whether or not residual Aroclor is present and whether it modifies the residual amount of Lindane or other active ingredient at harvest. 3) If Aroclor is present or if the residual quantity of Lindane or other active ingredient has been significantly changed, tolerances for the pesticide in question must be developed. 4) If a toxic quantity of Aroclor is present at harvest in food or feed crops a tolerance cannot be established until after two year chronic toxicity feeding tests have been completed for Aroclor [37].

Sherwood acknowledged that much of this would be obviated if the pesticide was not used on food crops, but “Even then the label must show safe handling procedures, since Aroclor is toxic.” He continued, “Admittedly, your August 27 *Bulletin* does not specify using Aroclor in insecticides for use on food or feed crops but neither does it specify such a combination *should not be used on food or feed crops*. [emphasis in original] Perhaps this is an over-sight which you will wish to call to the attention of recipients of the bulletin.” In a postscript, Sherwood explained why such a warning was so important:



P.S. We repeatedly find that users of formulations prepared for a specific use will apply the material for other uses. In other words, even though Monsanto may encourage the use of Aroclor in pesticide formulations for non-agricultural use you can rest assured that some of it will be used on agricultural commodities. For these reasons alone it is strongly recommended that we state very specifically in any Monsanto literature, including correspondence, that Aroclors not be used on agricultural commodities. I believe our Legal Department will confirm that there is an important legal aspect involved [37].

In 1950 Monsanto's medical Director, Emmet Kelly, wrote to Indiana's director of industrial hygiene that the company "advised protection against all Aroclor fumes when an elevated temperature is used" [38]. Around the same time, Monsanto reissued its warnings about chlorinated hydrocarbons in general and Aroclors specifically. The company warned that Aroclors should not be heated in open vessels above 300° because of possible skin and eye irritation and because "prolonged and repeated exposure to such fumes may, in addition to causing irritation, interfere with the normal skin functions and result indirectly in physiological disturbances" [39].

For most of the 1950s Monsanto continued to warn about the potential skin problems with Aroclors, but downplayed the systemic effects of inhaling PCB vapors. By early 1952 the dangers from chlorinated diphenyls were so well established that Monsanto entered into an agreement with the United States Public Health Service to insert a warning in all bills of sales. The warning stated,

This product is sold under direct agreement with the U.S. Public Health Service and if re-sold as such or in mixture thereof for further fabrication within the United States, it is necessary that such products be labeled as follows: 'This package contains (Name of Product) AVOID REPEATED CONTACT WITH THE SKIN AND INHALATION OF THE FUMES AND DUSTS.'

But Monsanto officials acknowledged privately that their "bills of sale do not carry the notation as given in the second part of the agreement noted above," even though the dangers from inhalation of Aroclor were prevalent since "so many of the new Aroclor applications involve their use at elevated temperatures." Further, they pointed out that while "the toxicity hazard of Aroclor's fumes is well established," Monsanto had encountered "violations" of safety precautions quite frequently and that therefore "keeping in touch with these things [is] a major responsibility in the promotion of Aroclors." The company recognized that the subject of Aroclor's toxicology was "not the easiest one in the world to understand" but stated very clearly Monsanto's responsibility to live up to what had emerged as industry standards to test for potential dangers of their products and to warn workers and consumers how to protect themselves against those dangers. Because they had such a "large stake" in Aroclors and because of the "rather widespread commercial use" of Aroclors "we constantly strive to learn more about this subject of Aroclor toxicology and to safeguard against any possible hazards" [40]. Yet, at this point, Monsanto had not yet done any long-term chronic toxicity studies.



The acute and subacute toxicity of PCBs continued to worry Monsanto in the early- to mid-1950s. In June 1953, a confidential report from the Monsanto Phosphate Division’s Research Department found that the “Aroclor vapor concentration in the air at the sample points is seldom below the 0.5 to 1.0 mg. per cu. meter level, which is the maximum tolerable concentrations (according to Elkins, See References), and often is as high as 3 to 5 mg. per cu. meter.” It noted that “these higher concentrations are extremely irritating to the eyes, nose and throat” [41].

Thus, one Monsanto official wrote to another that “As I am sure you know, Aroclors cannot be considered nontoxic.” He thought, however, that the hazards of PCBs were minimal “when using Aroclors in transformers” [42]. Similarly, in 1954 after several workers developed acne in an Aroclor plant, air tests showed “only negligible amounts of chlorinated hydrocarbons” and led to the conclusion that “fairly long continued mild exposure is not innocuous.” It was suspected that “the low concentration of the chlorinated diphenyl might account for development of lesions in only 50% of those involved” [43].

By 1954, Monsanto officials were searching for data on the toxicity of Aroclor. In a February 27th memo entitled, “Aroclor Toxicity” one of their European officials described searching through “our files” and finding one report “containing data on Aroclor toxicity.” The internal report was from 27 April 1948 and included a section copied from the *Journal of Industrial Hygiene and Toxicology* from February 1938. The report noted the “systemic toxicity effect which chlorinated hydrocarbons including chlorinated biphenyls can cause. Liver damage is of course the outstanding effect and of the various chlorinated hydrocarbons tested, chlorinated diphenyl gave evidence of being the most toxic” [44].

Also in 1954, the Medical Director at Monsanto acknowledged that there was no known “maximum allowable concentration of Aroclor,” even though a “one milligram per cubic meter has been set up.” The Company had been running animal experiments “for about 60 days at 7 times this [1 mg level] and found some liver damage.” At the time they were also experimenting at lower levels. Even though the company claimed that they had “never found any liver trouble in any of the workers in our plant,” they recommended that their customers use exhaust ventilation in their manufacturing processes. Kelly was concerned about the exposure of painters to Aroclors, which were an ingredient in some new latex paints, and worried about unwarranted liability suits from painters who might develop hepatitis and ascribe it to their work with paints containing Aroclors. Monsanto was, however, “concerned with the level of Aroclor during spray painting, but I think that level can only be determined by actual measurements.” There is no evidence that spray painters were told of Monsanto’s concerns, but Kelly acknowledged a possible hazard internally, writing to Dr. Newman in London that “we certainly want you to have the entire picture about Aroclor toxicity.” It appears from the memo that Monsanto was awaiting a report from the Kettering laboratories at the University of Cincinnati [45].

Monsanto continued to do its own research into the possible dangers of the use of Aroclor as a plasticizer in Saran Wrap and latex paints [46], and within the company there were continued concerns about the toxicity of Aroclors and other compounds through “absorption from the inspired air,” and contact with the skin causing “a serious and disfiguring dermatitis” [47].



Monsanto's Medical Director, Dr. Emmet Kelly, "summarized" the company's views regarding the toxicity of Aroclor in the mid-1950s. "We know Aroclors are toxic but the actual limit has not been precisely defined." He explained that the market for Aroclors was growing, particularly in consumer products, and that both workers and consumers who developed liver disease might have a history of Aroclor exposure. Legal liability therefore was a threat because, in his view, "juries would not pay a great deal of attention to MACs [Maximum Allowable Concentrations]." It was with consumer liability in mind that Monsanto "review[ed] every new Aroclor use.... If it is an industrial application where we can get air concentrations and have some reasonable expectation that the air concentrations will stay the same, we are much more liberal in the use of Aroclor." But in consumer products, the problem became much more complex:

If, however, it is distributed to householders where it can be used in almost any shape and form and we are never able to know how much of the concentration they are exposed to, we are much more strict. No amount of toxicity testing will obviate this last dilemma and therefore I do not believe any more testing would be justified [48].

Consumer exposures presented a major challenge for a company used to thinking in terms of industrial toxicology.

The dangers of PCBs and potential liability affected even the management of specific plants. In November 1955, the Medical Department at the Aroclors Department in the Krummrich plant in St. Louis, recommended that "the eating of lunches should not be allowed in this department" because "Aroclor vapors and other process vapors could contaminate the lunches unless they were properly protected." It therefore left the possibility that "where a workman claimed physical harm from any contaminated food, it would be extremely difficult on the basis of past literature to counter such claims" because such literature "claimed that chlorinated biphenyls were quite toxic materials by ingestion and inhalation" [49].

In 1955, Monsanto contracted with the Kettering Laboratories to conduct studies of short and medium term effects of Aroclors on rabbits, mice, rats, guinea pigs, and a cat. In the private report to Monsanto, the lead researcher, J.F. Treon, identified a mouse that developed a "malignant lymphoma that involved the liver, spleen, kidneys and heart, and therefore its death was attributed to natural causes" [50]. The next year (1956), Treon published his report in the *American Industrial Hygiene Association Journal* but omitted any mention of the cancerous mouse [51]. Further, neither Treon nor Monsanto conducted long-term chronic toxicity studies at that time.

In 1956, Monsanto tried to interest the Navy in using one of their products Pydraul 150, as a material for elevating the antennas in submarines. The Navy was worried about the use of PCBs in its atomic submarines which could "remain submerged for periods of up to 6 weeks" which meant that "any possible toxicological effects [could not] be tolerated." Monsanto worried that Pydraul 150 which contained 25% of Aroclor 1240 would face "demise ... in the antenna retracting mechanisms of submarines unless we can present a convincing story as to its safety of use" [52].



In June, Kelly “had quite a discussion with the navy people concerning the use of ‘Pydraul 150’.” He was informed by the Navy that their industrial hygiene group thought that because the submarine would be submerged for so long, that submariners would inevitably be exposed to higher levels of PCBs than what was acceptable. While Kelly told them that in his opinion this would not occur, there was continuing worry on the part of the Navy. Kelly suggested that Monsanto test Pydraul 150 for if “we don’t do this work, we haven’t a chance of getting 150 used on any submarine. If the work turns out favorably, there might be a very good chance that it might be used not only on the radio antenna but also on all the hydraulic systems on a submarine” [53]. By December 1956, the prospects for using Pydraul 150 in submarines seemed very dim. The Navy was receiving negative information about its toxicity. Despite doubts at Monsanto about the significance of the Navy’s findings with regard to humans on submarines, it was becoming apparent “among us [at Monsanto’s headquarter] here in St. Louis that this is about the last straw in our relationship with the [Navy’s] Bureau of Medicine.” Wheeler believed that “apparently we can do nothing about influencing [Commander Siegel’s] conclusions based on such tests.” Apparently, while they were abandoning the attempt to “develop toxicity data on hydraulic fluids for the Navy,” Monsanto continued to get “information to satisfy ourselves that the use of our fluids is safe under any normal foreseeable conditions. This is generally enough to satisfy non-military customers” [54].

In January 1957, Monsanto’s Dr. Kelly “spent an afternoon with the navy people” to discuss Pydraul 150. The Navy informed Monsanto that they had done their own toxicity testing of Pydraul 150 at the Naval Institute of Medical Research. The Navy researchers found that “Pydraul 150 caused death in all of the rabbits tested,” while an alternative fluid “did not cause any deaths.” Further, they learned that “10 mg of Pydraul 150 per cubic meter ... for 24 h a day for 50 days caused statistically, definite liver damage.” Kelly informed Monsanto that “no matter how we discussed the situation, it was impossible to change their thinking that ‘Pydraul 150’ is just too toxic for use in a submarine. It may be that such concentrations would never be reached in a submarine but the Navy does not appear willing to even put the material in a trial run to see if it will work.” Kelly concluded that Monsanto “should discontinue to sell ‘Pydraul 150’ for this particular application and try to develop a hydraulic fluid without Aroclor as one of its components” [55].

By September 1957, Monsanto was in negotiations with the Navy over the release of “commercially discreet information” regarding Pydraul 150 and its components. What was at issue was that the Navy wanted to publish its research on the toxic dangers of this material. Monsanto worried that Aroclor’s reputation would be tarnished. “In publishing such data” Monsanto’s S. Robert Sido reported, “they [the Navy] feel they would have to be rather specific chemically to be meaningful but could avoid all reference to trade names, hydraulic fluid or Monsanto.” Monsanto wanted to avoid informing consumers about their product’s possible dangers [56]. Also in September, Monsanto learned that not only would the Navy not accept Pydraul 150, it most likely would not accept any “other fluid containing chlorine or chlorinated diphenyls.” Monsanto concluded that it would not try to “dissuade BuMED [Navy Bureau of Medicine] since it appears to be hopeless” [57].



Despite the Navy's rejection of Pydraul 150 on health grounds, Monsanto continued to reassure their customers that the material was safe. For example, in a letter from Elmer Wheeler, Assistant Director of the Medical Department, to James Lofstrom at Standard Oil's corporate headquarters at 30 Rockefeller Center in New York, Wheeler did not mention the Navy studies. Instead, Wheeler wrote that "the toxicity report on Pydraul 150 indicates that it is practically innocuous when fed orally to rats In rabbit skin and eye irritation studies Pydraul 150 was no more irritating than a 10% soap solution tested similarly" [58]. Also, in a May 1957 Monsanto Technical Bulletin, Monsanto wrote "Animal toxicity studies and 20 years of manufacturing and use experience indicate that Aroclor compounds are not serious industrial hazards" [59].

In 1958, other major corporations shared the Navy's concerns about Pydraul. That year some states passed labeling laws which were "brought forcibly to [Monsanto's] attention" by the Socony Mobil Corporation that requested a caution stamp to "be affixed to all Pydraul which they purchase from Monsanto for resale." Monsanto worried about the wording which Socony Mobil was planning to use on their product for it was "not in the best interest of Pydraul sales, and is such that our competition could use to great advantage." They were specifically concerned that the label identified chlorinated hydrocarbons with danger from breathing and physical contact. Monsanto's label was simpler and much less specific, telling customers simply, "Avoid prolonged and repeated contact with skin. Avoid prolonged breathing of vapors and dust." Monsanto stated quite explicitly (but privately) that they wanted to

comply with the necessary regulations, but to comply with the minimum and not to give any unnecessary information which could very well damage our sales position in the synthetic hydraulic fluid field.... I am requesting that you and Mr. Carpari discuss what is necessary from the labeling viewpoint and the legal side, in order to comply, but yet maintain our excellent position in this field [60].

In June 1959, Emmet Kelly wrote to Monsanto's O.F. Heasel about the company's attempt to promote "the sale of Pydraul AC [another hydraulic fluid that contained PCBs] in Germany." He was concerned about German attitudes about toxic substances.

If these Germans are afraid of mineral oil, I feel they will be rather suspicious of Pydraul AC. After all, the constituents are considerably more toxic than mineral oil. The odor or taste would be considerably more marked than mineral oil, should any of the material get into the food.

Kelly believed that Monsanto had to "be factual and tell them that Pydraul AC has an LD₅₀ to rats of 40 gm./kg and in rats 3 1/2 gm. to 4 1/2 gm/kg." Kelly suggested that "if, however, there is a possibility that vapors would enter the food or beverage, a filter should be incorporated in the line." He wrote that a charcoal filter would be able to absorb "organic vapors and any objectionable odors." He concluded that he thought "the Germans are being overcautious in this matter,



but,” Kelly admitted, “I certainly can’t give Pydraul an absolutely clean bill of health, assuming some might get into the food” [61].

Reassuring customers and government alike: new problems and challenges in the 1960s

The 1960s were a tumultuous decade in United States history. The Vietnam War, the civil rights movement, the women’s movement as well as a growing environmental consciousness all challenged the political and social complacency of the post-war world. This section details the growing concerns about the potential dangers of PCBs. It also details the efforts by Monsanto to reassure its customers and others that their product was safe.

In 1960, the issue of environmental stream pollution emerged in the internal memos of the Monsanto Company. Jack Garrett, an industrial hygienist in the medical department, wrote to an official in a tool company in Chicago about the potential dangers to aquatic life if Pydraul fluids were discharged into streams around factories. “As you know,” wrote Garrett, “the Pydraul fluids are insoluble in water as well as heavier than water.” This meant that they would “sink to the bottom of any receiving stream and as such will not give rise to the typical picture of oil pollution.” Despite the fact that one would not see the typical oil slick on top of the water, if Pydraul were “discharged in large concentrations it will adversely affect the organisms in the bottom of the receiving stream which will affect the aquatic life in the stream.” He acknowledged that some factories discharged “large concentrations of these materials” and if this were “contemplated,” Pydraul should “probably be removed by emulsion breaking and settling.” At that time, the industry had “no experience with any regulatory agency concerning the discharge of these materials,” but Garrett “imagine[d] that these agencies would frown on the discharge of large quantities of any type of hydraulic fluid.” Further, Garrett reassured the representative that “Based on the toxicity studies of these fluids with laboratory animals [he] would not expect them to be very toxic to aquatic life.” He acknowledged, however, that “this is a surmise on my part since we have no tests on aquatic animals.” While Garrett believed that “if small quantities of these materials are accidentally spilled into a receiving stream there would probably be no harmful effect,” he also recognized that “If, on the other hand, a great deal of the material was spilled some readily identifiable damage might ensue” [62]. Thus, in 1960, years before any articles appeared on PCBs in the environment, Monsanto understood that there were potentially deleterious consequences to their discharge into streams and rivers. The growing body of data on the dangers of PCBs in general appeared to lead the company into a particularly defensive position in the early 1960s. In February 1961, Emmet Kelly wrote a memo to Richard Davis, an official in Monsanto’s Organic Chemicals Division in the St. Louis office, about an incident at the Hexagon laboratories in the Bronx where two employees were “nauseated from exposure to a leak in a heat transfer unit that used Aroclor 1248” [63].

One of the employees was suspected of having liver damage. Less than 2 weeks later, the Chief Engineer at Hexagon learned in more detail about the two plant



personnel and their conditions. Both men, he reported, “developed symptoms of Hepatitis as you predicted and were confined to a hospital for approximately 2 weeks.” The experience had given him “considerable concern.” He was particularly upset with the lack of adequate information about the toxicity of PCBs:

Since we are dealing with a highly toxic material at high temperatures and since these failures cannot be prevented, it is felt that a more thorough and clearly written description of the hazards be described under Safety of Handling.... I trust that this matter will be given your serious consideration so that other or new users are fully aware of the problem [64].

Leaks were not only occurring in industrial processes but in the food industry as well. Monsanto learned between 1960 and 1967 that the indirect heating by PCBs of cooking oils in deep fat fryers were themselves polluting the oil in which food was being fried. In 1960, Monsanto received a report of concern from the Frito Lay Company about PCB-polluted cooking oil. Frito Lay “suspected a leak in their heat exchanger” [65, 66].

A year later, Marcus Key of the US Public Health Service (who would later become the head of National Institute for Occupational Safety and Health) received a letter from Kelly in which was enclosed a copy of Monsanto’s Technical Bulletin PL-306, “Aroclor Plasticizers.” Previously, Key and Kelly had had a telephone conversation about chloracne and other dermatological problems and any potential dangers from Aroclors. Kelly reviewed the data on these problems as outlined in the *Bulletin*, and reaffirmed that safe handling of Aroclors demanded “the necessity for avoiding exposures, particularly when the Aroclors may be used in applications where elevated temperatures are involved.” Despite growing knowledge within the company of problems with their product, Kelly reassured Key that “our experience and the experience of our customers over a period of nearly 25 years, has been singularly free of difficulties.” He went on assure Key that to Monsanto’s “knowledge, there have been only three instances where chloracne has occurred. In view of the millions of pounds which have been produced and used in many and varied applications, the low frequency of any difficulties has been gratifying.” Despite having heard directly from Hexagon laboratories and Socony Mobil that better warning labels were necessary, he told Key that Monsanto had “Certainly ... attempted to provide sufficient information to insure safe handling and usage. We have not in any case attempted to minimize potential hazards” [67]. (The assertion that there were “only three” cases of chloracne ever identified by 1963 was clearly not true, as Kelly himself had attended meetings as early as the mid-1930s about the chloracne problem when Swann was taken over by Monsanto.)

Monsanto received, at least by 1963, results from its test site at the University of Florida at Gainesville where, in 1938, it had deposited Aroclors 1242, 1248, and 1254 in test soil. Monsanto learned that as of June 1963, nearly a quarter century later, there was “still visual evidence of the presence of Aroclor” [24].

By 1964, the issue of warnings and what constituted ‘adequate information’ was being discussed in Washington as well as at Monsanto. The Federal Hazardous Substances Labeling Act, which became law in 1960, had led to discussion about what legal responsibility Monsanto had with regard to warnings. It was clear that “Under



the provisions of the subject act, Aroclor 1232 would be classified as a ‘toxic’ substance.” But new research indicated that PCBs might be even more toxic than previously suspected. “We have several indications that the Aroclors are more toxic when in an oil solution than when administered undiluted to animals.” Monsanto appears to have tried to shift responsibility to its customers. “The ultimate responsibility of the labeling of a formulation remains with the customer,” E. P. Wheeler, of Monsanto’s Medical Department, said “since we cannot be expected to get animal data on every possible formulation containing a Monsanto product.” He went on to suggest that “the very minimum precautionary statement that I think would be necessary would be: ‘CAUTION—Harmful if Swallowed. Keep out of the reach of children.’” [68]

In 1965, it became clear that customers were depending upon Monsanto to furnish them with adequate information about the potential dangers of their PCB compounds. Wheeler had written to one customer, the Reliance Electric and Engineering Company in Cleveland, Ohio, about some potential dangers of the use of Aroclor 1242. Subsequently, the owner of Reliance Electric had a telephone conversation with Wheeler during which he told him how “disturbed” he was by Wheeler’s letter.

He told me that the Monsanto literature furnished him has been more reassuring in terms of what problems might arise in their application. I guess what really shook him was when I mentioned that with temperatures greater than 150 [degrees] mechanical exhaust ventilation should be provided to remove vapors. For the record, Mr. Haredos’ application involves the use of Aroclor 1242 as a coolant in electric motors [used in mines].

For Mr. Haredos, the warnings and information in the literature were clearly inadequate. Mr. Haredos estimated that the motors in this mining equipment took approximately ten gallons of PCBs, of which “four quarts per day of this quantity would be lost in the mine—presumably all of it by volatilization.” Wheeler informed him that he “doubted that the ventilation [was] sufficient to keep this amount of Aroclor at the threshold limit value of 1.0 mg/cu. meter of air.” Wheeler was horrified at the conditions in the plant where “hot Aroclor spills on the floor were common and that [Haredos’s] own employees had complained of discomfort.” Despite Monsanto’s earlier reassurances to Marcus Key, Wheeler was very disturbed: “I was brutally frank and told him that this had to stop before he killed somebody with liver or kidney damage—not because of a single exposure necessarily but only to emphasize that 8 hour daily exposures of this type would be completely unsafe.” Monsanto recognized that PCBs should only be used in closed systems because of their toxicity: “I told Mr. Haredos further that the Medical Department was skeptical about the use of Aroclors in mining operations because we had not seen data to show absence of toxic levels. I emphasized and re-emphasized that the Aroclors are excellent products but must be used in closed systems if they are to be heated” [69].

Despite the fact that Monsanto had not yet conducted any long-term chronic toxicity studies, it reassured its customers that fear of its product causing cancers, the most fearsome of chronic conditions, was unfounded. “The question of possible carcinogenesis was brought up,” Emmett Kelly the Medical Director at Monsanto, wrote to I.M. Singer at Dupont.



This certainly can be dismissed completely, as we have no reason to believe the components of this compound would have this type of action. We have never had the slightest rumor of this from our customers and certainly no tumors have arisen in our workers manufacturing the material [70].

PCBs in everything: Monsanto's response to environmental science, 1966–1969

Despite the early information about the systemic dangers of PCBs, and their widespread use in products that could ultimately leak into the environment, it took independent researchers to document that they had become a widespread environmental pollutant. This section details the identification of PCBs in the environment in the mid-1960s and the reaction of Monsanto to these discoveries.

In 1966, a startling study appeared from researchers at the University of Stockholm, Sweden. Soren Jensen and Gunnar Widmark, of the University's Institute of Analytical Chemistry, used gas chromatography and mass spectrometry to study the impact of pesticides on a variety of fish and fauna. They were looking for DDT and other pesticides, but to their surprise, they found other "unknown compounds" in the biological samples which they identified as polychlorinated biphenyls. They found "a large number of samples" which revealed that "polychlorinated biphenyls are found especially in fish and in sea birds ...and in some samples of human depot fat." It was a troubling revelation that human beings were accumulating the minute amounts of PCBs [71].

The Swedish Study was disturbing to Monsanto. David Wood of Monsanto Europe, received a letter from a law firm in Sweden that talked about the "publicity in Sweden" generated by the study. In his letter, Oda Palm quoted extensively from an article in a Swedish daily newspaper that condemned PCBs. "It is found in Salmon and in Pike. It is found in Sea Eagle living on fish. It is found on the surface of the needles of the fir treesIt is found in the hair of a 5 month baby." Palm warned that the study had revealed that PCBs "accumulated in certain organs of animals. They are said to be related to DDT and equally poisonous." Palm reported that another daily paper remarked on the significance of Jensen and Widmark's study. It "disclosed facts which will have far-reaching importance because the findings have proved a new source of pollution of ... nature." Palm concluded his letter with a statement about the implications of this study for the future of the industry:

I suppose there is no doubt that what has been termed Polychlorinated Biphenyls is equal to Aroclor. There is also no doubt that the published facts will cause considerable unrest in several quarters. We probably will have to have Aroclor registered with the Swedish Board of Poisonous Substances and the industry will have to be particularly careful in handling the material [72].

The full impact of this study and the potential harm it could do to the company was not lost on Monsanto officials in Europe and the United States.



In consideration of the importance we are placing on development of the Swedish market for Aroclor over the next five years, we would be grateful if you could arrange for this information to be considered by the appropriate departments in St. Louis and their comments transmitted to us as soon as possible. Based on the recommendations made by our medical departments we shall have to decide whether to arrange for publication of data in Sweden or not [73].

There was an increasingly important problem of how to dispose of PCBs. Wood noted that this would be difficult: “in the U.K. many companies have been burying material in drums, material in the drums having been absorbed into vermiculite or some similar porous material. Has any entirely safe method been developed for the disposal of waste Aroclor?” [73]

Simultaneously, Monsanto had contracted with a professor at Mississippi State University to test the fish in streams polluted by the waste water of the Anniston, Alabama PCB plant[74]. In November 1966, the Mississippi zoologist reported to Monsanto on the results of his investigation.

The outflow to Snow Creek from the east side of the Monsanto plant (at Highway 202) contains some extremely toxic materials and kills fish in less than 24 hours when diluted 300 times. In a flowing system (as opposed to our static tests) and under conditions of constant exposure, this effluent would probably kill fish when diluted 1000 times or so. Since this is a surface stream that passes through residential areas, it may represent a potential source of danger to children, domestic animals, etc. [75].

By January 1967, Monsanto was acknowledging internally the importance of the Swedish study, and the company was convinced that the materials tested were “very similar if not identical to Aroclors.” They also discussed this work with other chemical companies in Europe and were “assured that his work and findings are sound” [76]. By late January, Dave Wood, who was based at Monsanto’s affiliate in Brussels, wrote to officials in the various Monsanto offices around the world that he “should like to emphasize that there is no doubt that the chemical which is the subject of the investigation and the news release, is chlorinated diphenyl i.e. Aroclor.” Wood was especially attentive to the widespread effect in Sweden of this new information:

This matter was raised with us by every capacitor manufacturer in Sweden that we visited. Fortunately, there has not been too much adverse comment as yet from plant workers since they have not associated the polychlorinated biphenyls mentioned in the article with Aroclor or Pyralene used in the Swedish factories [77].

While there had not been “too much adverse comment,” the Swedish scientist who had discovered the widespread contamination, Soren Jensen, “stated that he had been approached personally by several workers associated with chlorinated diphenyls for non-electrical uses and these workers were quite worried about possible effect on their health.” There was nothing in the documents to indicate



that Monsanto informed workers in the United States of the Swedish study. By this time Monsanto officials had been in contact with Jensen at the University of Stockholm, offering to provide him with materials to test. They had also spoken with Jensen about

the need for care in any further publication of his work.... He accepts that the toxicology of chlorinated diphenyls should only be discussed with detailed information about exposure concentrations and exposure times and that generalized statements out of context can only arouse undue public concern.

The problem of the safe disposal of PCBs continued to concern Wood [77].

In early February, a Monsanto official in Europe wrote to an English chemical company that had inquired about the “safe handling and toxicology of Monsanto Aroclors.” The official wrote that

like so many other chlorinated hydrocarbons the Aroclors can cause damage to the liver as a result of prolonged exposure to the vapour and to the liquid. To the best of our knowledge no fatality has ever been attributed to the chlorinated diphenyl, but in view of the chronic action on the liver we advise that contact with the vapour and liquid must be kept to a minimum [78].

By the mid- to later 1960s, issues of water and air pollution, DDT and other environmental insults were being linked to the chemical industry in particular. The industry had become, in the words of Monsanto’s Medical Director, “very worried about what is liable to happen in the states when the various technical and lay news media pick up the subject.” Monsanto had received “quite a few communications from our customers, but the most critical one is NCR,” who used huge quantities of PCBs as an ingredient in their carbonless carbon paper. Kelly reported that Monsanto wanted to “keep in the background” about the PCB environmental and occupational “problem,” but didn’t “see how we will be able to in the United States.” Monsanto, according to Kelly, needed to prepare for customers, “especially NCR, [who] may ask us for some sort of data concerning the safety of these residues in humans.” He worried that this “might be opening the door to an extensive and quite expensive toxicological/pharmacological investigation” [79].

By February 1967, more professional and scientific journals paid attention to PCBs in the environment, detailing the “Swedish success in detecting the polychlorinated biphenyl.” Monsanto internally noted that by the end of January, *Chemical Engineering* in the United States took note of the Swedish study, marking the “first published information in the U.S.” Monsanto was also aware in December 1966, the British journal, *New Scientist* had reported on the Stockholm study [80].

“Due to the importance of Aroclor products to the Organic division,” Monsanto decided to prepare a statement “for use by marketing with customers who inquire about this publicity.” Further it began preparation of a press release and to give some thought to the “toxicological and pharmacological problem.”



Monsanto comforted itself that information was still relatively inexact and incomplete: “two questions that kept coming back to our minds ... were that in all of the propaganda published, there has been nothing about the levels that have been found particularly in the air and no one has defined anything about what level would be considered harmful.” Gene Wilde of Monsanto’s general office offered to help to “get these motions started and getting our information together so that we can make sure our Aroclor business is not affected by this evil publicity” [81].

In May 1968, Stanford University proposed a research project on the environmental pollution caused by PCBs. Kelly rejected it as “another example of widespread interest in what appears to be a rather insignificant phenomenon: namely, the persistence of PCBs in some species.... I would be against our doing anything [about Stanford] at this time.” He proposed waiting until the US government acted: “I think it would be wiser for us to find out what the government is doing and see where we go from there” [82].

In the mid-1960s, Monsanto began to consider whether the danger from large doses of PCBs to industrial workers who were known to develop chloracne and liver disease were also true of “small quantities [of PCBs] existing in human fat” [83]. According to Kelly, “there is no question but that Aroclor does possess a certain amount of toxicity.” He noted that “all our literature says this.” But “whether nanogram quantities mean anything is an entirely different matter” [84]. Based on information that Kelly received from Dave Wood of Monsanto’s affiliate in Brussels, “The customers [in Europe] would like some reassurances on the toxicity of Aroclor.” Kelly acknowledged in February 1967, that “everybody over there is 100% convinced that what Jensen and Widmark found was Aroclor” [85]. But, based on concerns voiced by a Shell Oil Company scientist, fresh questions arose in early 1967 about whether the materials that Jensen and Widmark found were, in fact, PCBs. These concerns were put to rest by early November 1967 when A. Richardson of Shell informed Monsanto that it was, in fact, PCBs that were being identified in Europe. D.V.N. Hardy of Monsanto wrote, “Now that it is certain that the contamination by chlorinated biphenyls is taking place we are keen to follow up and determine just how and where the contamination is taking place” [86]. Despite their knowledge of the PCB pollution in Europe, the Monsanto Board of Directors approved spending almost \$3 million for “expanding Aroclor facilities at the Aniston, Alabama, and W.G. Krummrich plants” [87].

Aroclors were being introduced into more and more products that could lead to PCB pollution of the environment. One Monsanto publication in September 1967 reviewed the brief but dramatic history of Aroclors: “We began operations 31 years ago, but in all probability you have never heard of Aroclor or its uses,” it began. “Mainly this is because it is sold in bulk to manufacturers who blend it with other chemicals to make many items used by you in your home or in your car.” The material was ubiquitous, being used in “...plastics, lacquers, paints, waxes, insecticides, adhesives, pigments, ballast on fluorescent lights, carbonless carbon paper” [88]. An internal Monsanto publication a few months later reviewed the use of PCBs in these products and articulated the goal of expanding these uses in the following year: “What we hope to accomplish during ‘68 centers on the following items (1)



meet '68 sales requirements; (2) Start-up new manufacturing facilities to enable us to meet future sales requirements" [89].

Monsanto was faced by two competing needs: the first was to expand the market for Aroclors; the second was to figure out a way of protecting itself from the increasing evidence that PCBs were a widespread environmental pollutant. The environmental issue began to loom larger and larger in the thinking of Monsanto officials. In November 1968, an "Outline PCB Environmental Pollution Abatement Plan," noted that PCBs were "already present in nature having done their 'alleged damage'." Monsanto worried about the "Legal Liability" and the possibility of lawsuits because "All customers using the products have not been officially notified about known effects nor [do] our labels carry this information. These are only a few of the possible legal implications which would best be covered by the legal department" [90].

Increasingly, Monsanto worried about its public image, an issue that would become increasingly prominent over the next few years. "The corporate image of Monsanto as a responsible member of the business world genuinely concerned with the welfare of our environment will be adversely affected with increased publicity," a report on the PCB Environmental Abatement Plan warned. "The evidence proving the persistence of these compounds and their universal presence as residues in the environment is beyond questioning. This combined with certain scare publications is certain to give an adverse image." Monsanto was worried that PCBs would be linked in the public mind with the controversy then whirling around DDT and thus PCBs would be "guilty by association." "Some customers who presently use these materials will be 'scared' [off] to other competitive products. Products associated with the same name or 'trademark' will be adversely affected." The plan warned that Monsanto's products, Therminol, Pydraul, and Aroclor would lose market share to competitors who "will use the information as a competitive advantage" [91].

Monsanto had reason to be concerned. DDT was under attack and, in the words of one author in 1969,

the tide has been running against DDT ever since Rachel Carson's *Silent Spring* appeared in 1962. In fact, Carson specifically identified DDT as a possible human carcinogen. DDT production was at its peak then – 183 million pounds – and by 1967 it shrank to 103 million, 70% of which was exported.

Some of DDT's defenders had "raised the possibility that DDT may be taking the rap for PCB..., a plasticizing agent widely used by industry" [91].

By the end of 1968, the growing attention to environmental pollution led Monsanto to focus more and more on the "legal-political problems facing Aroclor." In a memo from W. R. Richard of Monsanto's Research Center in the Organic Division to W. A. Kuhn, Richard noted "the accusations in the literature that chlorinated biphenyls are poisoning and killing wildlife." This was not a trivial issue, he remarked, because "these wildlife people have to be taken seriously. They have taken the DDT industry to court in Wisconsin to prevent the use and sale of DDT ...and



if they win in that state DDT will be banned in many others The wildlife people are dedicated to the demise of DDT.” He noted that Monsanto had a real problem:

Our problem is that Aroclor has been ‘identified’ along with DDT residues and hence we are almost certain of being drawn into the court records and may also be one of the scapegoats of the DDT defense. The wildlife people have accused Aroclor of doing all the bad things of DDT [92].

There were three steps that Monsanto was taking to “protect ourselves.” First, studies with chickens fed with Aroclor were being done in the hope that Aroclor would not remain in their tissues. Second,

E. Wheeler is having feeding tests done on animals to establish a ‘safe’ level for Aroclor feeding. If we can find a ‘safe’ level Calandra’s Lab will do 2 year experiments on animals including effects on succeeding generations. This will help a bit but the wildlife people won’t be stopped by this kind of evidence [92].

Finally, they hoped “to minimize exposure to Aroclor, to reduce air and water pollution, to restrict Aroclor to uses which can be controlled. This is the only way I see to survive.” Richard believed that the Anniston plant was vulnerable to criticism as a possible polluter and that “Aroclor should be 100% controlled.” He also hoped to “demonstrate that Aroclor can be incinerated to harmless products for disposal” and wanted Monsanto to “help our customers dispose of off-grade or non-reworkable Aroclor, either by incinerating or by toxic dump.” Richard believed that it was the responsibility of the plasticizer group to “know where their product is going and be able to minimize exposure risk if Aroclor has truly been identified as a pollutant. We probably have 6 months to 1 year while they fight out the DDT case. I want to use this time to minimize our exposure” [92].

In early 1969, Monsanto and the world learned about a major industrial tragedy in Japan attributed to PCBs pollution: “...bran oil poisoning of quite a number of Japanese citizens ... was attributed to Kareclor 400 (chlorinated biphenyl comparable to FR-2)” [93]. In 1968 in southern Japan, a thousand people “had eaten rice oil contaminated with PCBs that leaked from a heat exchanger during manufacture.” These citizens had “developed darkened skins, eye discharge, severe acne, and other symptoms of what came to be called Yusho oil disease....” Allan L. Hammond, an independent scientist, in an article published in *Science*, described the tragedy, pointing out the disturbing information that was gathered from this incident: “The PCBs can readily cross the placental barrier, and several infants were born with Yusho symptoms, some to apparently unaffected mothers.” Hammond, citing scientists in Japan, wrote that “recovery appears to be difficult... with symptoms still present in many cases 3 years later; no methods of treatment are known” [94].

Monsanto understood the implications of this tragedy. Don Roush of the Functional Fluids Division, wrote that while the company believed they had “a good track record here in the States using Therminol FR ... it only seems a matter of time until the regulatory agencies will be looking down our throats regarding the



use of this material.” They were hopeful that their feeding studies would show results that would ease people’s minds. “Possibly, by the time this comes about, we will have completed feeding studies [with chickens] with chlorinated biphenyls that will allow us more exact data than has been available in the past.” Ultimately Roush believed that engineering could control the most serious aspects of the environmental problem. He wrote, “I can only suggest that you attempt to put [a colleague’s] mind at ease regarding the ‘toxic’ aspects of these chlorinated biphenyls by playing down the medical reports and playing up proper system design.” He concluded by asking Monsanto’s representative to show “some discretion” in distributing this data [93].

Back in the United States, Monsanto had hoped that incineration would break down PCBs, thus neutralizing their toxic effects, and providing a means of disposing of PCBs in carbonless carbon paper and other products. But in March 1969 they learned that the Aroclor present in the National Cash Register Company’s (N.C.R.) carbonless copy paper was not destroyed by incineration. A study they sponsored revealed to Monsanto that “Aroclor is easily volatilized when N.C.R. paper is burned,” and “undergoes little, if any, decomposition.” This was bad news for the company: “Unfortunately, it appears that significant air pollution can occur via burning of N.C.R. paper or other Aroclor containing materials even under more strenuous conditions” [95].

The company soon received even more bad news with the publication of an article that they had read in draft form several months earlier. At the end of October 1968, Elmer Wheeler of Monsanto’s Medical Department wrote that a technical paper provided to him by Donald Spencer of the National Agricultural Chemical Association, reported that a researcher “has found PCBs along with chlorinated pesticides in a number of species of fish and birds along the California coast as well as in waters off Baja California and Central America” [96]. The paper by R.W. Risebrough of the Institute of Marine Resources, Department of Nutritional Sciences, University of California, Berkeley, was published by the prestigious journal *Nature* in December 1968 and, according to Monsanto’s W. R. Richard, “has attacked chlorinated biphenyls in three ways” [96].

First, the article made clear that PCBs were a “pollutant” that was “widely spread by air–water” and was “therefore an uncontrollable pollutant.” Second, it was clearly “a toxic substance—with no permissible allowable levels” and was “causing extinction of [the] peregrine falcon by induced hepatic enzymes which degrade steroids upsetting Ca [calcium] metabolism leading to reproductive weakness, presumably through thinner egg shells.” Finally, PCB was “a toxic substance endangering man himself.” The implications were dire: “the peregrine falcon is a leading indicator of things to come.” Even worse in some ways, was a report in another prestigious journal, *Science*, that the Environmental Defense Fund was seeking to “write new legal precedents in conservation law by hearings and court action.” Monsanto was in a bind. They believed that they could

take steps to minimize pollution from our own chlorinated biphenyl plants, we can work with our larger customers in minimize pollution, we can continue to set up disposal and reclaim operators. We can work for minimum



exposure in manufacture and disposal of capacitors, transformers and heat transfer systems, and minimize losses for large hydraulic users [96].

But once the material was sold to other manufacturers and even consumers the company's ability to control environmental pollution was lessened.

We can't easily control hydraulic fluid losses in small plants. It will be still more difficult to control other end uses such as cutting oils, adhesives, plastics, and N.C.R. paper. In these applications, exposure to consumers is greater and the disposal problem becomes complex. If chlorinated biphenyl is shown to have some long term enzyme or hormone activity in the ppm range, the applications with consumer exposure would cause difficulty [96].

Risebrough's work presented Monsanto with real problems and Richard laid out the stark choice the company faced:

Either his position is attacked and discounted or we will eventually have to withdraw product from end uses which have exposure problems. Since Risebrough's paper in *'Nature'* Dec. 1968 has just been published, it is timely, perhaps imperative, that this paper and its implications be discussed with certain customers. This is a rough one because it could mean loss of business on empty and false claims by Risebrough.

He urged the company to engage in “well prepared discussion with Ind. Bio-Test [Industrial Bio-Test, a toxicological laboratory], Monsanto biochemists, the medical and legal departments, and that such discussion must take place now.” Richard concluded his memo to Wheeler and others by asking them to examine the experience of DDT manufacturers: “We are being accused of the same things attributed to DDT” [97].

The threat was serious and Monsanto responded with a press release in March 1969 that sought to raise doubts about both Risebrough's and Jensen's research. “The conclusions of these scientists are puzzling from several aspects,” the press release asserted. PCBs “are stable chemical compounds which are essentially insoluble in water. Their use does not make them easily released into the natural environment.” Monsanto claimed that they were primarily used in sealed systems such as transformers and capacitors, and also “in several plastic-type applications. Here the chemical is incorporated into the polymer as an integral part of the solid material. This applies whether the polymer is used as an adhesive, an elastomer or a surface coating....” The company claimed ignorance. “To our knowledge, [PCBs] are not sprayed or dusted on crops, woodlands or any other areas, as are pesticides.” They feigned surprise that it could be found widely dispersed in the environment. “It is, therefore, not only puzzling, but extremely difficult to conceive how commercially produced PCB can show up in wildlife in the quantities reported.” Despite their private acknowledgment that what Risebrough and Jensen had found were PCBs, publicly, they raised “the question whether the substances identified in the Swedish work, and now in California, are actually PCBs—or whether they are compounds which, due to the metabolism or other materials in the marine environment, appear to be PCBs.” Monsanto took the position that what was needed was more research.



Monsanto will continue to exercise the highest degree of control in its manufacturing, shipping, and storing of PCB – as we do with all products. The source of the marine life residue identified as PCB is not yet known. It will take extensive research, on a worldwide basis, to confirm or deny these initial scientific conclusions [98].

About the same time, Richard and other Monsanto personnel met with Industrial Bio-Test Laboratories (IBT) and created a list of possible academic consultants “who might be of help on this problem” [99]. Robert Metcalf, an entomologist at the University of Illinois, had been suggested as a consultant at the meeting with IBT and, evidently, accepted the offer because he issued a Report to Monsanto about a “Meeting on Chlorinated Biphenyls in the Environment at Industrial Biotest Laboratories” in Chicago on March 21, 1969. In his Report he noted that “the background data presented” at the meeting suggested that “something of the order of 80 million pounds” of PCBs were being produced annually. He wrote that “at first thought it seems unlikely because of the major uses of PCBs in capacitors, transformer oils, [and] heat transfer fluids in closed systems, that these materials could be the source of the substantial degree of environmental contamination reported.” But, Metcalf noted, “about 40 million pounds annually is stated to be used in plasticizers, hydraulic fluid, adhesives, and in carbon paper.” He concluded therefore, that “a very substantial percentage must escape into the environment as waste” [100].

Further, making the situation worse was the “apparent high stability of PCB,” which meant that the PCBs “entering the environment would be degraded very slowly and it seems possible that at least 10 million pounds annually may become environmental contaminants.” He noted that PCBs had been in production for 40 years and “if this has averaged 50 million pounds per year, then about 2×10^9 [two billion] pounds have been made and perhaps 2×10^8 [two hundred million pounds] have entered the environment.” He further concluded that because of the “apparent stability” of PCBs “most of the PCBs that entered the environment may still be circulating in the global ecosystem.” He concluded his report to Monsanto with the following warning:

It seems to the writer that the evidence regarding PCB effects on environmental quality is sufficiently substantial, widespread, and alarming to require immediate corrective action on the part of Monsanto. The defensive measures presently underway will do little if anything to refute the evidence already presented [100].

He suggested that Monsanto undertake a major effort to begin “a substantial analytical program to monitor air and water effluents from Monsanto plants producing PCB and also those of major customers.” He also suggested “prompt correction of effluent conditions where PCB can be demonstrated.” Further, Metcalf suggested to Monsanto that “serious consideration of curtailing sales of PCB for uses such as plasticizers, adhesives, and carbon paper where waste is certain to enter [the] environment.” In addition to suggesting that Monsanto review its own disposal and recovery methods for PCBs in “capacitors, transformers, heat transfer fluids, and hydraulic fluids,” he told Monsanto that the company should “emphasize



to customers [the] importance of preventing environmental contamination.” (It took almost a year for Monsanto to issue such a warning to its customers.) He suggested that Monsanto conduct a “thorough investigation of environmental fates of various PCBs, including petrochemical oxidations, chlorination in water systems, etc.” Further, he proposed that Monsanto conduct a “biochemical and electron microscopic study of levels of PCB ingestion which cause proliferation of endoplasmic reticulum and induction of multifunction oxidases in chickens and rats.” Finally, Metcalf suggested to Monsanto that the company “begin investigations of possible biodegradable substitutes for PCBs as plasticizers, adhesives, fire resistant hydraulic fluids, etc., anticipating loss of these markets as a necessary corollary of environmental problems” [100].

Monsanto’s own experiments revealed that one of the major uses of their PCBs, carbonless carbon paper, was contributing to environmental pollution through a primary disposal method: burning. In March 1969, they learned that PCBs were “Easily volatilized when burned,” and underwent “little decomposition.” Their conclusion was that “Unfortunately it appears that significant air pollution can occur... burning of N.C.R. paper [or] other Aroclor containing materials” [95].

While Metcalf was providing Monsanto with his assessment of the “alarming” environmental contamination caused by PCBs, Monsanto itself was discussing ways to measure the environmental impact of PCBs through a study of a test site at the University of Florida. In 1938, Monsanto had mixed Aroclors 1242, 1248, and 1254 in test soil on the University grounds at the Gainesville campus. Elmer Wheeler suggested that the company might “look into the possibility of obtaining samples of these plots for measurement of loss or ‘degradation’.” [24]

Monsanto, recognizing that environmental pollution presented a major threat to their business, began, in the spring of 1969, to consider working with major companies to control pollution. W.R. Richard wrote that in order “to defend the Aroclor position, it seems that we should provide for disposal of and incineration of off-grade fluid and work with Westinghouse and Findett on the disposal of the off-grade capacitors as well.” He believed that the “control of the total material balance for Aroclor will be important for future operation. We should therefore help control the entire cycle of a capacitor.” Already, the company was reclaiming used Aroclor to put into new Pydraul hydraulic fluid. But this presented a problem for the company. It would not, in Richard’s words, “satisfy pollution people” and would “just bring the focal point to hydraulic fluids that much sooner” [101].

Even as they were learning about the threats that Aroclors presented to the environment, Monsanto’s Corporate Development Committee learned that the president of the company “advised that he would recommend to the Board of Directors for approval \$1,100,000 for solid Aroclor expansion [at] Anniston” [102]. Despite knowing that Aroclors were endangering the environment and that they were in the effluents of their plants, Paul Hodges of Monsanto’s General Offices, wrote that the company had “generally taken the position that, before any expensive projects are undertaken to halt sewerage of Aroclors, we should know what levels exist in the receiving waters” [103].

The information about the various ways that PCBs were entering the environment built up rapidly at the end of the 1960s. Monsanto faced the problem of how



to provide information to both the public and the government about the dangers of Aroclors specifically and PCBs in general. It was at this time that Elmer Wheeler learned of a conversation between Dave Nelson of Monsanto's Research Center and Bob Day in the Cincinnati Laboratories of the National Air Pollution Control Administration. Day had called Nelson asking "for any information Monsanto might have relating to what might happen to chlorinated biphenyls in products that might be incinerated." Nelson was immediately taken with Day for he felt that this public employee "was not a 'Knight on a White Horse' but was reasonable and objective." Soon, Nelson found out an aspect of Day's past that explained part of the reason he was "reasonable and objective." Nelson told Wheeler that "Day finally told me that he is a Monsanto employee from Pensacola fulfilling his military commitment as a member of the Commission Corps. in the Public Health Service." Nelson was pleased with the conversation and told Wheeler that Day would "send word back to Washington which will then be related to the members of Congress that the PCBs are not used in some of the applications which have been indicated in the public press and in general try to present Monsanto's views to wit: 'We cannot conceive how the PCBs can be getting into the environment in a widespread fashion and that the company is actively involved in research programs to try to shed some light on the situation'." [104] This spin on the information provided to the government was in spite of years of information about the environmental effects of PCBs during which the mechanisms by which PCBs entered the environment were being described in detail to Monsanto itself [105].

"Sell the hell out of them as long as we can": 1969

While they publically questioned Jensen, Widmark, and Risebrough's identification of widespread contamination by PCBs, in private company officials acknowledged the huge problem they faced. By August 1969, the concerns about PCBs had become so severe that Monsanto set up a Task Force that became the "Aroclor 'Ad Hoc' Committee." At its first meeting, the PCB Task Force reviewed the growing evidence that PCBs were in a wide range of products in different states and in previously unidentified locales. The Georgia and West Virginia health departments had found it in milk; Japan had found Aroclor 1248 in bran; Therminol was being used for heat transfer fluids; it was in detergent; a government lab found PCBs in soap; it was in Electrosol dishwasher liquids; over 10% of samples identified PCBs in Lake Michigan; it was in mud samples in Pensacola, Florida; and, of course, in San Francisco Bay. The notes from the meeting indicated that the "subject is snowballing." In hand-written notes, a Task Force member summarized the sense of the meeting: "where do we go from here" and listed the "alternatives" as "(1) Go out of business. (2) sell the hell out of them as long as we can and do nothing else" and "(3) try to stay in business in controlled applications—control contamination levels" [106].

The Aroclor Ad Hoc Committee's meeting on September 5, 1969 was chaired by E. P. Wheeler, at the time Monsanto's Manager of Environmental Health. The other members of the committee were W.R. Richard, manager of Research and Development of the Organics Division, E. V. John, Director of Public Relations, P.



V. Hodges, manager of Environmental Engineering, and M.W. Farrar, of Organics Research. The Committee agreed on three objectives: “(1) Permit continued sales and profits of Aroclors and Terphenyls. (2) Permit continued development of uses and sales. (3) Protect image of Organic division and of the Corporation [Monsanto].” In their background discussion, they noted that environmental damage had been quite extensive to that point: “PCB has been found in: a. Fish, oysters, shrimp, birds. b. Along coastlines of industrialized areas such as Great Britain, Sweden, Rhine River, low countries, Lake Michigan, Pensacola Bay, in Western wild life (eagles). It may be a global contaminant,” they remarked. They also noted, “PCB has been tied to DDT in effects on disappearance of wild birds that have fish diets.” The Committee also argued that Aroclors “have been shown to be safe in man in reasonable exposure concentrations” and Monsanto was “testing 100 ppm [of PCBs] in diet of rats and dogs on a rule-of-thumb basis that 1/100 of the toxicity level is safe and 1 ppm is probably the upper limit in total diet.” The company officials acknowledged privately that there had been a

test at Pensacola where 5 ppb was found to be toxic to shrimp in 18 days exposure. One problem we are facing is to keep the ‘safe level’ (?) for shrimp from being applied to e.g. Lake Michigan where more tolerant fish species probably exist. We need to show the safe level in shrimp, clams, oysters and several species of fish [107].

The Committee then discussed what they should do about reducing the toxic waste from the Anniston and Krummrich plants where PCBs were being discharged into nearby streams.

The question of exactly how far to reduce (how much money to spend) is not yet clear and expenditures to date have been comparatively small. It was agreed that, until the problems of gross environmental contamination by our customers have been alleviated, there is little object in going to expensive extremes in limiting discharges from the plants.

Their position was that Monsanto’s own pollution was minimal in comparison to the contamination caused by their customers. “In one application alone (highway paints) one million lbs/year are used. Through abrasion and leaching we can assume that nearly all of this Aroclor winds up in the environment.” Although the minutes do not give any details, the Committee had a discussion about the “philosophy of controlling sales or working with customers to prevent pollution by PCBs” [107].

That same week W.R. Richard wrote a memo to Elmer Wheeler entitled “Defense of Aroclor—F. [Functional] Fluids.” For Monsanto, the PCB issue was fast approaching a crisis point. On the one hand, Richard suggested that they should, as a “general policy... Make the Govt., States and Universities prove their case, but avoid as much confrontation as possible.” The company should “let government prove its case, on case by case basis.” Monsanto should “question evidence against us; Question shrimp toxicology especially other toxic chemicals” as well as raise doubts about the implications for regulation of a broad range of materials of



condemning Aroclors: “If Aroclor [is] bad, others must be worse,” he argued. On the other hand, the company should “Comply and work with public officials to meet or exceed requirements ahead of time.” The Company should “keep track of how much contamination—which sources.” They believed that the “probable outcome” was that they could “prove some things are OK at low concentration,” and that this would “give Monsanto some defense.” It was clear to Richard that the company could not “defend vs. everything,” because, “Some animals or fish or insects will be harmed.” The company also had to acknowledge that “Aroclor degradation rate will be slow,” and that this information would be “tough to defend against.” Richard was beginning to conceptualize a defense against the complete ban of PCBs: He suggested that “Higher chlorination compounds will be worse [than] lower chlorine compounds. Therefore we will have to restrict uses and clean-up as much as we can, starting immediately” [108].

By 2 October 1969, the Ad Hoc Committee had drafted a confidential report that outlined the profound depths of the emerging crisis over PCBs. The committee reaffirmed goals enunciated at the first meeting, but added the additional objective to “Protect the image of the Organic Division and the Corporation as members of the business community recognizing their responsibilities to prevent and/or control contamination of the global ecosystem.” By this date the committee believed that

there is little probability that any action that can be taken will prevent the growing incrimination of specific polychlorinated biphenyls (the higher chlorinated – i.e. Aroclors 1254 and 1260) as nearly global environmental contaminants leading to contamination of human food (particularly fish), the killing of some marine species (shrimp) and the possible extinction of several species of fish eating birds [109].

And it also acknowledged that “there is no practical course of action that can so effectively police the uses of these products as to prevent completely some environmental contamination.” But despite these acknowledgments, the draft report suggested that there were “a number of actions which must be undertaken in order to prolong the manufacture, sale and use of these particular Aroclors as well as to protect the continued use of other members of the Aroclor series.” In particular, they believed that while the continued use of highly chlorinated biphenyls could not be defended, “The continued use of the lower chlorinated biphenyls (less than 5 chlorines) and the chlorinated terphenyls in applications [were] amenable to such control that there is practically zero losses to the environment.” Further, they asserted the old toxicological principle that there was a level of exposure below which any product, no matter how toxic, could be made safe: “In the interim we would hope to establish by appropriate research efforts ‘tolerance’ or safe levels for particular Aroclors in the environment.” In light of this belief, they first recommended notifying customers who were using the more highly chlorinated biphenyls Aroclor 1254 and 1260 “of the environmental contamination problem.” “Legal and moral” considerations led them to this policy: “As the alarm concerning the contamination of the environment grows it is almost certain that a number of our customers or their



products will be incriminated. The company could be considered derelict, morally if not legally, if it fails to notify *all* customers of the potential implication” [109].

About 2 weeks later in a document marked “Company Confidential—Attorney- Client Privilege” a second draft of the above report was sent by the committee to Rodney Harris, Jr., Director of Monsanto’s Law Department. This report reviewed the growing knowledge of chlorinated pesticides as well as PCBs over the previous fifteen years. The experience with DDT provided a model for the environmental damage that PCBs were causing:

For the last fifteen years there has been growing world-wide concern regarding the persistence of chlorinated pesticides (particularly DDT) and their universal presence in man, food, animals, fish, birds, air, water, and soil. DDT and its metabolites have been found in virtually every living organism and matter around the globe – including penguins in the Antarctic and the polar ice cap.

Similarly, during just the last few months,

PCBs have been reported in: a. Milk in Georgia, b. Waters of Lake Michigan, c. Fish in Connecticut, d. Sea food along the gulf Coast (toxic – fatal to shrimp at Pensacola), e. Electric dishwashing compounds, f. Milk in Maryland, g. Bald Eagles from the mid-west and h. Mother’s milk (rumor – not confirmed) in Denver [110].

The first and a major conclusion of the committee was “*That the identification of the PCBs as a contaminant of the environment is certain.*” [Emphasis in original] In addition the committee acknowledged, “There is no question as to the non- or low-biodegradability of the PCBs—particularly the higher chlorinated Aroclors 1254 and 1260 and probably 1248.” It asserted that this was clearly an industry created problem as “the possibility of [other] origins of the PCBs ... is so remote that it is not a satisfactory explanation for their presence.” The report also acknowledged that the highly chlorinated compounds, particularly 1254 and 1260, were widely identified in the literature as contaminants [110].

While the environmental issue was clearly identified in this document, the committee also acknowledged that “possible toxic effects” could result if workers were exposed to this material.

There have been a limited number of cases of occupational disease where workmen have been exposed to excessive vapor inhalation or repeated and prolonged skin contact with subsequent development of skin manifestations (‘chloracne’) or more serious involvement of the liver and kidneys.

In their evaluation the committee asserted that “PCBs may be ‘moderately toxic’ to man.” They believed that their own toxicological studies on rats and dogs, along with a new study of three generations of rats, to be conducted by their consultant, Industrial BioTest Laboratories, will be made “available to the U.S. Food and Drug Administration and other federal and state agencies” and would “confirm that the levels of PCBs being found in nature—and particularly in human



food—do not constitute a serious threat to public health.” Studies with fish, however, presented problems for the company. Fish “can concentrate/accumulate persistent chlorinated hydrocarbons in their tissue. For example, trout raised in water containing 1 part per billion will contain 1 part per million in their tissues in 6 weeks.” This buildup presented potential problems where fish consumption was high. “In Sweden and other Scandinavian countries, where fish make up a large portion of the daily diet, the use of DDT has been temporarily or permanently banned,” the committee noted. Similarly, several states have taken action to ban the sale of fish and “bills have been presented in Congress to outlaw the sale and use of DDT.” The committee noted that just in the previous summer, “the U.S. Food and Drug Administration seized and destroyed Coho Salmon caught in Lake Michigan” [110].

The committee also worried about a second consequence, the “alleged effect on species of coastal and other fish-eating birds.” These data were “interpreted by a number of scientists (and seized upon by the conservationists-pseudo-scientists)” as evidence that certain “birds face elimination or absolute *extinction* because of persistent chlorinated hydrocarbons in fish which make up the major portion if not all of their diet.” One troubling aspect of this problem was that bald eagles were identified as a bird at risk by the US Department of the Interior. “Now the emblem of the heritage of the United States is threatened!” The growing body of evidence that indicated that birds, fish and even shrimp were accumulating or being threatened by PCBs presented serious problems for the industry and particularly tended to undermine their hope that a threshold level could be found below which PCBs were not harmful [110]. (Emphasis [on *extinction*] is in the original.)

The committee acknowledged the difficulty of preventing environmental pollution even at Monsanto’s own plants. They noted that in one plant “up to three gallons per day was being lost to the river from the use of Pydraul AC in air compressors.” Despite all the ambiguity in the data that indicated that there might not be a well-defined threshold limit, the committee suggested that “PCBs are ‘moderately’ toxic to man” but that “a probably safe level for Aroclor 1254 and 1260 in the diet will be something less than one part per million.” The committee also argued that while adult birds or fish were not grossly affected, “the ‘safe long term’ or ‘chronic dose’ is less than 100 ppm insofar as reproduction is concerned.” It also argued that shrimp were “safe” when exposed to Aroclor 1254 at levels “less than five parts per billion.” They took solace from the conclusion that “we may be able to show some kind of reasonable numbers for ‘safe levels’ of Aroclor 1254 and 1260 (and other chlorinated biphenyls) in some species” but worried that “there are other species of life in the ecosystem where a *zero to 5 parts per billion* limit for Aroclor 1254 and 1260 ... will be the tolerance level” [111]. [Emphasis is in the original.]

The committee remarked on the changing political context and specifically the influence of the growing environmental movement on their image and ultimately, the market for their products. As of that moment, in late 1969, “there are no restrictions which control the current uses of our Aroclors or PCBs.” They were



faced, instead with pressure being applied relatively to persistent chlorinated hydrocarbon pesticides in general and specifically DDT. The evidence proving the persistence of these compounds and their universal presence as residues in the environment is beyond question.

While the Committee believed that the importance of this fact was unclear, “the development of ‘lunatic fringe’ post-Rachael Carson has led to a domination of the media by scare publications in the public and scientific press.” They warned that the business community in general had to pay attention to this: “Only the most myopic individual in the business world could be unaware of the overwhelming interest and influences being directed at preventing contamination of the environment. The principal groups with an apparent avowed mission of providing a world of pristine pure food, water and air include many in academic and political fields who recognize the headline value of statements supporting these ideals.” This was particularly important for those concerned about PCBs:

as environmental contaminants, the committee believes that Monsanto is faced with a barrage of adverse publicity in all elements of the news media – including those with national coverage. Factual basis will be sparse or non-existent but guilt by association (with DDT) will provide background and prevail.

The committee was pessimistic: “The public and legal pressure then to eliminate or prevent global contamination are inevitable and probably cannot be contained successfully” [110].

But the threats would not come from the environmentalists or regulators alone, for the producers of DDT and other chlorinated pesticides “will not be loathe to incriminate the PCBs as being culprits in the development of misleading data relative to their concentrations as residues.” Also “the manufacturers of competitive products will seize any opportunity to point out to our customers their potential problems if they continue to use products containing Aroclors. This has already occurred in the case of our Pydrauls.” Monsanto officials were increasingly concerned about possible laws and regulations governing dangerous products, particularly food additives [110].

The committee concluded that “the identification of PCBs as an environmental contaminant is certain” and that the “toxicity to some biological species at extremely low levels (a few parts per billion) is significant.” The committee also concluded that PCBs “are persistent once they become a part of the environment and the rate of degradation is extremely low.” The committee also ruled out the “likelihood that the PCBs appear in the environment as a result of ‘natural’ origin on the metabolism or degradation of other chlorinated hydrocarbons.” The dismal conclusions of the committee led one participant to state in his handwritten notes that Monsanto should “contact all customers” to “assure them that there is no way to contaminate without detection” [110].

At the end of October 1969 Monsanto “confirmed the adequacy of work by Widmark and Jensen and others” that pointed to PCBs as a “*world-wide ecological problem*.” [Emphasis in the original] They also noted that while Aroclors 1254 and 1260 were clearly a problem, “other Aroclors may contribute, but have not been identified



yet.” The company recognized that this problem had multiple effects on Monsanto, including that its “business potential [was] at stake on a world-wide basis,” that it faced “legal responsibility,” that its “public image” was at stake, and that it could have an “effect on other product areas.” The company was also concerned about the effect of this problem “on Customers and Ultimate Consumers.” This would include the “entire electrical industry—capacitors and transformers,” food processing, dye casters, and other ‘hot metal’ working industries, a “wide range of plastics and adhesive applications,” as well as a “wide range of paints and coatings.” It acknowledged that the “main sources of pollution” were

difficult to define, but Aroclor 1254 and 1260 are used in electrical devices, heat transfer, plastics, adhesives, coatings, and industrial fluids.... Manufacturing plants also a *vulnerable* contributing factor, but less significant in *quantity* than customer or end user losses.

Although Monsanto thought that it was “possible to control” the PCB pollution in electrical and heat transfer units “with effort and reclamation,” “industrial fluids, plastics, coatings and adhesives are very difficult, if not impossible to control. Substitute products needed” [111].

In early December 1969, R.H. Munch of Monsanto’s Organics Research Division wrote to W.R. Richard about the dilemma that Monsanto faced with regard to the future of PCBs. Don Olsen had raised a fundamental question: “How we should go about reaching our objective of being the world leader in the Aroclor business.” Munch suggested reformulating the question: “Under present conditions this question should probably be changed to: How should we go about achieving maximum profit from dielectric fluids or dielectrics in general?” He argued that “there are two reasons for changing the question. One is the environmental pollution problem. The other is that technological needs in the dielectrics area are changing with ever increasing rapidity. Both are compelling reasons” [112].

Publicly acknowledging environmental danger: 1970

By the early 1970s it was impossible to publicly maintain that PCBs were not an environmental pollutant as researchers, newspapers, environmental groups, government agencies and congressmen detailed the wide variety of ways PCBs were contaminating the Great Lakes, rivers and streams in Alabama, fisheries, milk supplies in Ohio, shrimp in the Gulf of Mexico, birds on the west coast, New York’s Hudson River and other regions of the country. This section outlines Monsanto’s acknowledgment of this environmental pollution, its efforts to limit the use of PCBs and ultimately its phase out of what they termed “open uses” in the American market.

By the beginning of the new decade, Monsanto was receiving more and more bad news. In January 1970, Monsanto representatives met with General Electric Corporation, perhaps Monsanto’s biggest customer of dielectric fluids, to discuss “the PCB-Pollution Problem.” General Electric had “requested and we were pleased to give Dr. Murphy their Environmental Control man, a list of all GE and other locations receiving Pyranol shipments in 1969.” Monsanto estimated that these locations



accounted for “about 16 million pounds of askarel fluids with economic worth of near 2.5 million dollars.” Of special concern was that they had shipped this material to “244 different locations of which 115 were GE plants and service shops scattered throughout the country...” and that “Environmental Sources of PCBs from Dielectric Applications” polluted the environment from “1. Spills; 2. Disposal of waste; 3. Ultimate disposal of product—for failed apparatus; 4. Ventilation of operation for employee protection; 5. Waste from containers; 6. Field on service failures; 7. Repair and return apparatus ‘service shops.’” [113]

Now, their largest customers were pushing back against the argument that Monsanto had used only a year before—that Aroclors were used almost exclusively in “closed” systems that the company couldn’t imagine would enter the environment. This was not sustainable. Benignus told Monsanto’s corporate leadership of the enormous contamination produced in the electric industry itself:

Estimated Annual Amounts of Contaminated and Scrap PCBs from the electrical Industry; 1. From the Transformer Industry:....Near 2 million pounds a year of transformer askarels are sold to service and repair shops....As these service shops are devoted primarily to repairing faulty transformers, we can assume that as much as 1.0 million pounds annually of ‘scrap’ is generated. Most of this has been dumped or disposed of in streams.” “2. From the Capacitor Industry: a) Collectable waste from normal capacitor impregnation operations amounts to about 850,000 lb annually [113].

Mr. Wheeler reported “on chronic animal toxicity tests and animal reproducibility studies underway” which had turned out to be “not as favorable as we had hoped or anticipated.” Wheeler wrote that it was “particularly alarming” that the chicken studies (referred to earlier) of Aroclor 1242, 1254, 1260 found “evidence of effect on hatchability and production of thin egg shells regards white leghorn chickens.” Wheeler concluded that “some of the studies will be repeated to arrive at better conclusions” [113].

At the same time Monsanto officials learned of new, even more troubling information. Elmer Wheeler of the Medical Department reported that the company’s animal toxicity studies showed that PCBs were “exhibiting a greater degree of toxicity ... than we had anticipated.” In addition, the problems with PCBs were “about the same as DDT in mammals.” Even more worrisome was “additional interim data which will perhaps be more discouraging. We are repeating some of the experiments to confirm or deny the earlier finding and are not distributing the early results at this time” [114].

By mid-February 1970, officials at Monsanto’s headquarters in St. Louis were paying close attention to Aroclor’s environmental problems. In a “Pollution Letter” addressed to about twenty representatives in a variety of offices in the United States and throughout the world, N.T. Johnson suggested ways by which Monsanto representatives could talk to their customers about the PCB problem. Johnson suggested “a list of questions and answers which may be asked of you by customers receiving our Aroclor-PCB letter.” He told his representatives that when asked questions, that representatives “give verbal answers; no answers should be given in writing.” He suggested that if a question were asked that the representative could not answer, “or



if he wants an answer in writing, then send his question to me and we will answer it from here” [115].

Foremost, Johnson wrote, “We want to avoid any situation where a customer wants to return fluid.” New “reformulated products will be available within a month,” he wrote, and “we would prefer that the customer use up his current inventory and purchase [alternate Pydraul products] when available.” He argued that over a period of time the customer will “top off with the new fluid and eventually all Aroclor 1254 and 1260 will be out of his system.” Of paramount importance, he emphasized in his letter, was “*We don’t want to take fluid back.* [emphasis in the original] Sell him the replacement” [115].

Johnson saw this as a positive, even progressive move on Monsanto’s part. “We must be very positive in our approach with each customer We (your customer and Monsanto) are not interested in using a product that may present a problem to our environment. We certainly have no reason to be defensive or apologetic about making this change. ... No one has forced us to make this change.” He told the representatives to “be positive. Take the offense. Don’t let a customer or competitor intimidate you.” He argued that the company had to act responsibly: “We should also recognize (point this out to your customer) we must clean up. The Chemical Week article gives him an idea of laws in effect in his state. Read this yourself. Be familiar with the data of each state in which your customers are located. Use this in your discussions.” Monsanto still had a major problem: “We have no replacement products for Aroclor 1254 and Aroclor 1260. We will continue to make these products; however,” he pointed out, “customers will have to use their own judgment on continued use.” His final comments were most telling: “We can’t afford to lose one dollar of business. Our attitude in discussing this subject with our customers will be the deciding factor in our success or failure in retaining all our present business. Good luck” [115].

The January decision to focus attention on the highly chlorinated Aroclors—namely 1254 and 1260—was reflected in a letter sent out to customers concerning newspaper and magazine articles that highlighted the dangers of PCBs. On February 18, 1970, Donald Olsen, the Director of Sales of Monsanto’s Functional Fluids Group, wrote to customers about “newspaper and magazine articles” that reported that PCBs had “been discovered at some points in some marine, aquatic and wild-life environments. The quantities detected are said to be in the parts per million and parts per billion categories.” Olsen pointed out that “PCBs found [in the environment] strongly resemble chlorinated biphenyls containing 54 and 60% chlorine by weight. He went on to point out the various products that Monsanto produced that contained these Aroclors and that Monsanto was one of “several other companies around the world” that produced these chlorinated biphenyls. Olsen was somewhat reassuring to his customers, writing that there are many products that Monsanto produced that “are not formulated with Aroclor 1254 or 1260.” He also advised his customers that “PCBs with a chlorine content of less than 54% have not been found in the environment and appear to present no potential problem to the environment” [116].

Even so, Olsen said, “all possible care should be taken in the application, processing and effluent disposal of these products to prevent them becoming environmental



contaminants.” In public, Monsanto maintained that PCBs that were in closed systems did not represent a threat to the environment. But Olsen painted a very different picture in this private communication to Monsanto’s customers. He suggested that the buyers of “transformers and other electrical equipment containing dielectric fluids which include Aroclor 1254 and 1260” be aware that “although these fluids are sealed into such equipment it is recognized that occasionally the fluid may be lost through leaks resulting from equipment misuse or equipment repair necessitating replacement of the fluid.” He concluded his letter by saying that while Monsanto was not contacting each individual purchaser of electrical equipment, manufacturers of these end products should do so [117].

The information that Monsanto received about its toxicological studies continued to be bad for the company. In early March 1970, Elmer Wheeler, Manager for Environmental Health at Monsanto, wrote to Joseph Calandra of Industrial BioTest about Calandra’s view of the toxicity data of “three Aroclors in the rats, dogs and chickens. I think we are surprised (and disappointed?) at the apparent toxicity at the levels studied” [117].

William Papageorge, who had been “given the full-time assignment of coordinating all of the efforts on the PCB problem,” [117] wrote to a company representative in Tokyo about Monsanto’s plans for handling the Aroclor problem. He told J. R. Durland of the company’s decision to “reduce the amount of Aroclors in the plant effluents to essentially zero. Lacking any positive guidelines, we have tentatively selected a target of 10 ppb.” He reiterated the company’s “original plans to move toward discontinuance of 1254 and 1260.” But Monsanto re-evaluated even this limited response after “meeting with representatives of General Electric, [where] this decision to discontinue 1254 and 1260 was challenged. The G.E. representatives,” Papageorge reported, “believe that the benefits of these Aroclors in transformers far outweighs the yet considerable threat to the environment.” The new position of Monsanto that they planned to present to the Corporate Management Committee was that “in those situations where control is practical, such as transformer usage, we could continue to supply Aroclor 1254 and 1260” [118].

Papageorge noted the continuing problem of the PCBs used in N.C.R.’s carbon-less copy paper where “the ultimate destination of this product is difficult to control. Normal incineration vaporizes the Aroclor which eventually is found somewhere in the environment.” In contrast to the concern that Wheeler expressed about the IBT studies, Papageorge wrote that the studies of the “effects of Aroclor 1221, 1242 and 1260 on rats, dogs and chickens ... so far, have been inconclusive” [118].

But published studies were not inconclusive: *Science News* reported in late March 1970 that David B. Peakall, a researcher at the Langmuir Laboratory at Cornell University, found that PCBs “act in much the same way as DDT in causing a decrease of birdlife through action on eggshells.” He also found that PCBs behaved similarly to DDT in other ways: “They are very stable and nondegradable, they are concentrated by passing from the fatty tissues of one organism to another as they move up the food chain, and levels of them are nearly as high as DDT levels in some areas” [119].

Papageorge got even more bad news at the end of March 1970 when Emmet Kelly wrote him about a communication Kelly had received from “a Dr. Hill of



the Ohio State Board of Health.” Hill reported to Kelly that he had found “Aroclor 1254 in samples of milk from at least three herds in Ohio,” which he had traced back to the silos where the feed grain had been stored. “The silos are concrete silos whose interior surfaces were painted in 1967 using a formulation that contained 1254.” For Kelly this raised “a very serious point” that had legal and public relations implications.

When are we going to tell our customers not to use any Aroclor in any paint formulation that contacts food, feed, or water for animals or humans? I think it is very important that this be done. It may be that some of the customers will assure themselves on the basis of non-extractability that a particular formulation might be safe but I think we should make a blanket recommendation against these uses [120].

Despite the growing concern about the environmental and human health implications of PCBs as related in their internal documents, Monsanto downplayed the dangers in public. The stakes were raised for Monsanto in April when Congressman William F. Ryan, (D-N.Y.) “called for a ban on polychlorinated biphenyls.... [He] asked the Department of Agriculture to ban the use of PCBs in insecticides. He also asked the Food and Drug Administration to set food tolerance levels for PCBs and to conduct a study to determine if a ban is necessary” [121, 122].

In a press release issued in response to Ryan’s attack, the Company began by acknowledging the public concern over PCBs: “Monsanto Company said today it was well aware of the concern over possible environmental contamination by polychlorinated biphenyl (PCB), an industrial chemical made by the company.” But Monsanto argued that it was on top of the problem, having begun “a six-point program in 1968 to properly identify and measure PCB in the environment.” In addition they argued that “Steps have been taken to strictly control use of the chemical and replace those grades of PCB which linger in nature.” The press release argued that Monsanto was a responsible company that was doing all that it could to address the problem of PCB environmental pollution [123].

The press release quoted Howard L. Minckler, Monsanto’s Vice President and General Manager of its Organic Chemicals Division who assured the public that “PCBs is not a household product, as some have suggested.” This was not true, as it ignored the fact that PCBs were a critical constituent, for example, of N.C.R.’s carbonless copy paper, a widely distributed consumer product. Minckler said “to our knowledge it is not used in plastic food wraps, house paints, cellophane, asphalt or tires.” Minckler maintained that “the principal market is electrical applications where the chemical performs a vital function as an insulating fluid.” Despite the private concerns about the “occasional leakage” the press release argued that in these electrical applications “PCB is completely sealed in a metal container,” and “other major markets employ similar closed systems.” The press release tried to limit public concern about PCBs. Their research, it said, showed that the only real problem was with “the higher chlorinated materials” and that their “animal feeding studies [showed] PCB is not a highly toxic material” [123]. In April 1970, Monsanto acknowledged that it was not only in the air, water, fish, milk, mud sediment and in Lake Michigan but also in nine U.S. rivers and finally, in human fat [124].



In April 1970, the growing body of concern about PCBs reached the top of Monsanto’s leadership group, the Corporate Development Committee. Until this point the Organic Division and the Medical Department were the most actively engaged in developing “facts and knowledge about PCBs through gathering information, visits to universities, and work with industrial test laboratories.” They had kept in contact with “other worldwide producers, and other industrial collaborators” and had followed closely the scientific and other popular literature that addressed the problems of PCBs and environmental pollution. They had also funded “a toxicological and analytical test program in excess of \$100 M.” Now the leaders of the Functional Fluids and Plasticizer Business Groups, and the Medical and Law Departments made a presentation to the Corporate Development Committee to discuss their findings, and to provide the US Centers for Disease Control (CDC) with the information it would need to develop a long-term and short-term strategy for dealing with the PCB crisis. The group began with a brief review of PCBs and their relationship to Monsanto’s bottom line. Monsanto’s “worldwide Aroclor business” amounted to over 104 million pounds of which 70 million were functional fluids and 34 million were plasticizers. This resulted in \$22 million in sales per year for a gross profit of \$10 million per year. They then explained the Aroclor product line ranging from Aroclor 1221 which was a thin liquid to Aroclor 5460 which was a solid. The complete list included:

- Monochlorobiphenyl—Aroclor 1221—Thin Liquid
- Dichlorobiphenyl—Aroclor 1232—Thin Liquid
- Trichlorobiphenyl—Aroclor 1242—Oily Liquid
- Tetrachlorobiphenyl—Aroclor 1248—Oily Liquid
- Pentachlorobiphenyl—Aroclor 1254—Heavy Molasses
- Hexachlorobiphenyl—Aroclor 1260—Thick Tar
- Heptachlorobiphenyl—Aroclor 1262—Thick Tar
- Octachlorobiphenyl—Aroclor—1268—Thick Tar
- Decachlorobiphenyl—Aroclor 1270—Solid
- Terphenyls—Santowax—Solid
- Chlorinated Terphenyl—Aroclor 5460—Solid

They informed the CDC that a significant part of Monsanto’s business was now “being threatened not by competition but by recently found pollution problems,” and that “possible adverse legal and public relations problems [could be] leveled against Monsanto” [125, 126].

The leadership of the Functional Fluids and Plasticizer Business Groups, and the Medical and Law Departments presented four “Alternative Courses of Action” for the company executives to consider. The first alternative was “Do Nothing” but this “was considered unacceptable from a legal, moral, customer & public relations & company policy viewpoint.” It was considered “also the quickest route to being forced out of business.” The second alternative was to “Go out of Total Aroclor business,” and while this was considered unacceptable from a Divisional viewpoint it was presented as a possibility from a corporate viewpoint. Here the committee was asked to consider a partial solution to the company’s problem: “All Aroclor products



are not serious pollutants.” The committee was told that “many degrade,” but also “there is too much customer/market need and selfishly too much Monsanto profit to go out” of the business completely. “To go out would require a write-off of Aroclor net investment of \$7 M [billion] (10 cents/share) or if biphenyls [was] included \$8.8 M [billion] (12 cents/share).” In addition, the company would have to face the problem of what to do with their inventory, “the continuing cost of utilities and back up capital and serious manpower & resources reallocation at Anniston” [125].

“Markets—1969 Sales [in millions of pounds]—Major Aroclor used”

- Carbonless carbon paper—8.8—Aroclor 1242
- Hot melt adhesives—5.7—Aroclor 5460
- Swimming pool paints—1.7—Aroclor 1254; 5460
- Protective Coatings—5.3—Aroclor 1254; 5460
- Emulsion Adhesives—1.5—Aroclor 1254; 1260
- Sealants—3.0—Aroclor 1254; 1262
- Wax Modification—2.0—Aroclor 1254; 5460
- Miscellaneous—5.0—Aroclor 1248; 1254 [125].

The third alternative was even more limited. The company could get out of the more highly chlorinated PCB business specifically Aroclor 1254 and 1260. “[T]his was seriously considered and may eventually occur by our actions and customer actions,” but they still felt “that segments of this business are defensible or are so ‘confined’ in use that specific plans of action are called for this portion [of the market].” This alternative was also rejected. The fourth alternative was to “Develop specific action plans ‘tailored’ to each business group and each customer/market situation to ‘clean up’ the mess.” This “was the alternative selected at this point of time and based on our knowledge from a Divisional viewpoint as making Monsanto act in the most positive, responsible way to society and our customers as well as our interests.” However, “because of the magnitude and seriousness of this problem and its total implications for corporate Monsanto your guidance and approval is needed” [125].

The Functional Fluids and Plasticizer Business Groups and the Medical and Law Departments proposed what they called a “Joint Action Plan” to the CDC that included the following: Appointment of a Project Manager (the Project Manager position would be held by William Papageorge), who would be “responsible for the overall management of the Aroclor pollution problem. He [the Project Manager] would be assisted by a Task Force from members of each Business Group plus Medical, Law, Engineering and Manufacturing.” Further “all Aroclor customers of PCBs” would be notified about possible pollution problems and all containers would be re-labeled “within 60 days,” and Monsanto would “educate customers on need for clean-up at their plants—within 4 months.” Within a year the action plan called for a “Clean up” of the effluents from Monsanto plants. Aroclor 1254 and 1260 would be repackaged within six months and Monsanto would develop replacement products for Aroclor 1254/1260. Monsanto would “continue and expand [its] biodegradation test program ... [its] toxicological test program ... [its] analytical test program,” its search for alternatives for Aroclors 1242 and 1248, its study of incineration as a



means of disposal and its methods for developing Fluid Reclamation and Recovery.” The company was hopeful that

through this Action Program, Monsanto would expect to: 1. retain or convert a good portion of our business and profits 2. Gain further valuable knowledge 3. Clean up the major contributing PCB pollution factors. 4. Minimize customer complaints and hardships [12].

The CDC accepted the proposed action plan. To implement it Monsanto initiated a series of actions aimed at reducing the amount of PCBs it would produce in the future. It committed itself to “Reduce and effectively control the PCB content of all effluent from Monsanto plants” with the aim of achieving “50 ppb in effluent by January, 1971” and “10 ppb by September, 1971.” It reported that the “Newport, Anniston and Sauget plants [had] reduced losses considerably” but that “losses [were] still above the 50 ppb target.” Another of its objectives was to “Inform customers of the PCB problem and the importance of preventing environmental pollution both at their plants or by their customers.” Specifically, it aimed to “Inform customers in U.K., Canada and Japan by May 1, 1970; Europe and South America as indicated.” The company believed that it had met this goal with regard to Canada and the U.K. as “Customers in Canada and the U.K. were informed by July 1, 1970.” They lagged a bit with regard to “Customers in Japan, Europe and South America” who “have not been informed pending coproducer actions.” Also, the company had aimed to end distribution of Aroclors as plasticizers by September 1970, replace 1242 in N.C.R. paper coating “for U.S. applications by May, 1970...and for U.K. applications by July, 1970” and was pleased it was on target to achieve this goal. It had also found “acceptable substitutes” for Aroclor 1254 and Aroclor 1260 sealants and coatings and found other acceptable substitutes, allowing for the eventual phasing out of “persistent Aroclor-containing industrial fluids” which it planned to complete by April 1971. Pydraul 312 and Pydraul 150 still “pose major problems.” It sought to discontinue sales of polychlorinated biphenyls for cutting oils, pesticides, medicinals, and dental and cosmetic use by June 1970 and believed it was close to accomplishing it [127].

In mid-July 1970, Monsanto announced that it had “decided to restrict sales of the chemical because of mounting evidence that it can induce birth defects in animals.” In a letter to Representative Ryan, Monsanto said that it “would no longer sell PCB for use as a water-resistant plasticizer or as a hydraulic fluid.” The company wrote that it would continue to sell PCBs “for use as a coolant in electrical transformers because of its ‘unique properties’ and because its emission into the environment could be controlled in a ‘closed system’ such as a transformer.” *New York Times* reported that “the primary use of PCB has always been as a lubricant in transformers, the purpose for which Monsanto would continue to make it. The chemical also appears in a number of paints and adhesives that require a high degree of corrosive resistance” [128].

Berkeley’s Robert Risebrough, one of the first researchers to identify the environmental impact of PCBs, responded to Monsanto’s assurances that the product could be used safely since it would henceforth be used “only as insulating fluids in electrical and heat transfer systems where the PCBs are completely enclosed



and thus not likely to get into the environment.” Risebrough said “‘I’m not very optimistic. This electrical equipment is going to be thrown away eventually. With an expanding technology, I am afraid we will continue to have large amounts of these chemicals entering in the environment.’” According to an article in *Science News* Monsanto was still refusing Representative Ryan’s request to provide a list of all of PCBs uses. Monsanto was also refusing to provide “statistics on amounts of PCBs manufactured. A Monsanto spokesman admitted both charges this week, saying secrecy was necessary because Monsanto is the sole producer of PCBs” [129]. News reports did not mention that carbonless copy paper contained PCBs.

Whatever words were used to assuage public fear about PCB pollution, just a week later, Monsanto’s R.E. Keller of the Organic Research Division, acknowledged internally that the problem might be quite widespread. In a study of 167 samples of various environmental materials, Monsanto researchers detected “PCBs typical of our Aroclor products ... in water and sediment from nine US rivers, one UK river and Lake Michigan, air ... at the Anniston plant, fish from Lake Michigan and three midwest rivers, ... milk from Maryland and Ohio dairy farms,” and perhaps most distressingly, “human fat from a midwest biopsy specimen.” Further, Keller wrote that “The water, sediment and air samples contain PCBs typical of Aroclor 1242, 1248, 1254, and/or 1260. The milk, human fat and fish samples contain PCBs most typical of Aroclor 1254.” The problem was not just the Aroclor 1254 and 1260 [130].

In the same month, William Hunt from Monsanto’s Medical Division wrote to Kelly and Wheeler about developments in the rat reproduction and fish toxicity studies that Industrial BioTest was conducting. He reported that the fish toxicity studies conducted on catfish and bluegills were about 2–3 weeks behind schedule because of some unexpected results. He said that “doses [of Aroclor] which were believed to be OK produced 100% kill. At levels of 1–10 ppm for both 1242 and 1254, for 50 fish per level, all died. For 1260 at levels of 10 and 100 ppm, there were a few survivors at 10 but all were dead at 100 ppm” [131].

By the summer of 1970, Monsanto executives visited at least some of their customers “to discuss the PCB problem” and ways of avoiding at least some of the environmental pollution. After one such visit, Papageorge sought to reassure an uneasy executive at the Espey Manufacturing Company that his visit

did not intend to cause undue alarm or create any panic concerning the use and handling of polychlorinated biphenyls. We were primarily interested in sharing our current knowledge of the situation with you and offered to help wherever we could.

Up to this point, Papageorge explained, the PCBs “which are present in Monsanto’s Aroclors,” did “affect some species of birds and marine life,” but were “not acute poisons to humans and other mammals.” He suggested a variety of means that could be employed so that workers could be protected from exposure to Aroclors, and he pointed to methods that should be used to protect the environment. He also offered to “help our customers with their liquid disposal problems” by accepting “for future incineration scrap liquid Aroclors” for \$.03/lb plus the cost



of shipping. He closed his letter with an admonition that voluntary action was preferable to government regulation. He was

certain that you will do all that you can to reduce the escape of PCBs from your operation. When all of us succeed in this objective, I am certain that no regulatory agency will be compelled to take precipitous action regarding the use of PCBs in vital operations [132].

In 1970 articles started to appear in the popular press about PCBs. One such article in the July 9th issue of the *Miami Herald* described PCB as a “DDT-like poison.” In response, Monsanto’s Assistant Director of Public Relations, shot off a letter to the editor objecting to several “inaccuracies” in the article, including its assertion “that the manufacturer, Monsanto Company, is organizing ‘at federal request’ a campaign to reduce leaks of the chemical.” Monsanto objected that its actions were “not at government request. It was started in 1968 when we first discovered PCB might be a problem to the environment and long before many scientists or politicians knew of the issue.” Monsanto also objected to a “reference to a major PCB fish kill in Alabama last year,” stating that “there have been no major fish kills in the area of our Alabama plant since 1966, when heavy rains caused damage to our plant.” Seeking to defend their product, the company argued that “investigations showed that kill was not caused by PCB.” Most particularly, Monsanto objected to the characterization of PCBs as a poison but implicitly acknowledged the dangerous properties of PCBs by saying, “we are withdrawing it from sale where it is not used within a closed system...” [133]

Monsanto concluded their July 14, 1970 Letter to the Editor by arguing that the company had only recently become aware of the concern about PCBs because of technological advancements. “Scientific instruments capable of detecting small amounts of chemicals have not been available too long. But more to the point, no one bothered to use them to examine organisms in the food chain until a couple of years ago.” When it became aware of the problem, Monsanto argued that it had taken action: “Since that time, Monsanto, as a responsible company, has taken the initiative in solving the problem without pressure from government or organized groups.” Monsanto maintained that the company was providing a vital public service by producing PCBs that were critical materials “in nearly all electrical transformers.” To remove PCBs from production “would result in major power failures throughout the world” [133].

Two days after sending the letter, Monsanto issued a “news release on PCBs that dealt with Monsanto’s recent actions to curb the use of PCB” and to rebut “recent stories that PCB caused birth defects.” It also “included a complete background of voluntary actions taken to solve the PCB problem. Copies went to all news media who have carried PCB stories in the past 2 years” [134].

They also sent a letter to Congressman Ryan that the company “would no longer sell PCBs for use as a water resistant plasticizer or hydraulic fluid,” but that it would “continue to sell PCBs for use as a lubricant in transformers and for paints and adhesives.” Monsanto also said that it would refuse “to make public a list of all the products in which the PCBs were used” [135]. In August, Monsanto increased the use of its July 16th Press Release. They were pleased that “our practice of following up



each PCB story with our news release—to those media who did not receive the initial mailing—seems to be paying dividends. The Booth Newspaper chain in Michigan was the first to run our release. Other major dailies include the *Austin Statesman*, *Milwaukee Journal*, *San Francisco Examiner*, *Akron Beacon Journal*, *St. Louis Post-Dispatch* and the *St. Louis Globe-Democrat*. Trade publications using the release were the *Oil Daily*, *Chemical Week*, *OP&D* and *C&E News*.” At the same time, the company said it ceased shipping Aroclors for use as plasticizers in a variety of products [136].

While publicly the company sought to assuage growing concerns about Aroclors, privately officials were absorbing more and more bad news. One internal report on the Anniston plant in Alabama which had been the focus of the *Herald* article, told of massive losses of Aroclor to the environment. “Aroclor losses from the Anniston plant for the period April 15 through June 30, 1970, averaged 16 lbs./day,” noted E.C. Wright in a report on “Aroclor Losses at the Anniston Plant” in mid-July 1970. “This is a considerable improvement over the losses of >250 lbs./day for a comparable period during 1969,” he wrote. But even this good news was tempered by the fact that this information excluded the majority of the period April 21 to June 20, 1970 when “the losses ran very high” because the “acid neutralization pit was being cleaned out” and no specific measurements were being taken. Also, a number of samples “were collected from Snow and Choccolocco Creeks at various times” indicating other problems. “They show that Aroclors are present in the Choccolocco Creek even above where the Monsanto effluent enters the creek. They also indicate significant amounts of Aroclor in the mud and water of Choccolocco and Snow Creeks a considerable distance (15–20 miles) downstream from the Anniston plant. In fact, Aroclor concentrations can probably be found in the Coosa River system” [137].

Two weeks later the Company learned that the US Food and Drug Administration (FDA) was finding “high levels of PCB in fish taken from Choccolocco Creek downstream from its confluence with Snow Creek.” They were assured by Joe Crockett, Secretary of the Alabama Water Improvement Commission, that he would “try to handle the problem quietly without release of the information to the public at this time.” Monsanto was told that Crockett believed “that FDA will not act precipitately [sic] in this matter,” but that he was not sure “how FWQA [Federal Water Quality Association] might react. Dr. Myers, Director of Public Health of Alabama, wants toxicity information on PCBs and this will be conveyed personally to him by Jack Garrett next week” [138].

By September 1970, the company was losing faith that new data “might show an improvement over the 1st week in September and thus demonstrate a favorable trend to Crockett. Instead, the emissions are considerably increased with 9/13/70 at 6.25 ppm, (or about 80 lbs. of PCB for the day).” Potential legal liability for the pollution led the company to consider restricting access to the information they were gathering:

From the Legal standpoint, there is extreme reluctance to report even the relatively low emission figures because the information could be subpoenaed and used against us in legal actions. Obviously, having to report these



gross losses multiplies, enormously, our problems because the figures would appear to indicate lack of control [139].

While Monsanto was learning of the widening environmental problems it faced in Anniston, a PCB conference was being held in Stockholm. One of the papers detailed the long history of knowledge of dangers to the workforce of chlorinated biphenyls:

Already in 1899 Hersheimer described a condition that he called chloracne, which was caused by chlorinated biphenyls or chlorinated naphthalenes. Chloracne is a type of follicular pyodermitis, e.g. pyogenic inflammation in the sebaceous glands of the skin.... Around 10 cases of fatal intoxication with chlorinated biphenyls or naphthalenes have since been described. They all showed liver atrophy and necroses. Histological examination revealed fatty degeneration, necroses and cirrhosis. All cases involved persons who handled or were exposed to these compounds in their occupations.

Subsequent toxicological experiments “confirmed that chlorinated biphenyls and naphthalenes can produce liver damage of this kind....” The author reported that in comparisons between chlorinated naphthalenes and the biphenyls, “the biphenyls are more toxic.” The paper detailed the environmental impact on birds and fish, and described the growing body of evidence that showed that PCBs had a “tendency to accumulate in body fat and in the lipid-containing tissues of the brain. That is about all we know. Our knowledge about the metabolism of these compounds is minute.” Mathe Berlin, the author, concluded that

There is strong suspicion that chlorinated biphenyls can be retained and accumulated in the body with chronic exposure. Present data do not permit evaluation of the risk of organ damage in the body at different doses of defined chlorinated biphenyls. There is a strong need for studies of the metabolism of chlorinated biphenyls in the body, as well as the mechanism of the toxic effect due to those substances [11, 140].

As the evidence of environmental and possible human damage continued to grow, Monsanto learned that the PCBs that were placed in the ground in 1938 on the Gainesville campus of the University of Florida were still there. Over the thirty year period the PCBs had hardly degraded at all. Monsanto’s “Manager of Environmental Control,” W. B. Papageorge, wrote about the discovery of PCBs persistence and the reasonableness of disposing of PCBs in public landfills:

The laboratory information I was waiting for relates to a study made by Monsanto in the Gainesville, Florida area in 1938. Aroclor 1242 was one of several materials applied to soil in holes 15” in diameter and 16” deep. The walls were sprayed with a solution of Aroclor 1242 and the soil was replaced with each layer sprayed with additional Aroclor 1242. When the hole was completely filled, the remaining solution was poured on top. A total of 4 oz of Aroclor was applied. We have estimated that the Aroclor content was about 2200 ppm.” The previous year, he reported, the company



returned to the site to measure the remaining Aroclor and discovered that at 6 inches below the surface there were 2820 ppm, and at 6" to 16" inches 510 ppm and at 16" to 26" there were 26 ppm still present.

To Monsanto the conclusion was clear: "This data would indicate that after 30 years the Aroclor has not migrated to any significant degree." Although not commented on, the data also indicated that the Aroclor 1242 did not degrade [141].

In his monthly report on environmental problems, W. B. Papageorge began by emphasizing the fear of law suits as a motivation for the company's actions in removing PCBs from some of their markets: he emphasized "to all remaining users of PCBs the importance of preventing escape to the environment." He pointed out to Monsanto officials that "we must ensure that these warnings are fully documented so that they will support the action we have taken in this area should we become involved in legal actions." The company continued its efforts to find substitutes for PCBs in certain products but ran into difficulties with N.C.R. copy paper and industrial/hydraulic fluids. He also reported that "the withdrawal of Aroclor plasticizers from the market appears to have been completed with very few loose ends" and, remarkably, "our distributors are well on their way to zero inventories of the Aroclors, having pretty well matched their purchases from Monsanto with firm orders with their customers." He was pleased that "it does not appear that there will be any extensive returning of unsold materials." He also reported that the public relations efforts appeared to be bearing fruit as their July news release "stating our position to withdraw from certain PCB markets, was used in whole or in part by 13 more major newspapers...." [142]. Papageorge was referring to their August 1970 decision to stop selling PCBs as plasticizers [143].

In regard to Monsanto's efforts to inform their customers of the environmental problems associated with PCBs and their plans to build an incinerator to dispose of the material, Randall Graham, Monsanto's Senior Fluids Specialist wrote customers, "No longer can we dump scrap Aroclor or spent transformer [?] down the sewer. Indiscriminate dumping of such material can lead to serious repercussions for the electrical industry. For this reason Monsanto is building an incinerator which will be ready some time during the first part of 1971" [144].

Meanwhile, Monsanto continued to produce PCBs and to try to find new markets for its product. In October 1970, Monsanto, faced by the prospect of losing some of the US market, considered approaching the Indian government about "the desirability of the manufacture of [PCBs] in India." The company considered the "great potential of India" where it "identified ...areas where it [could] bring its technology to participate in and foster the economic growth of the country." Specifically Monsanto identified "India's fourth 5-year plan" as providing "for significant growth of electric power generation and use which in turn presages a growing demand for products with the dielectric properties of PCBs" [145]. Monsanto also sought to maintain its reputation by counteracting occasional news stories that appeared in the local and national press. In one such incident, reported E.V. John of Monsanto's world headquarters, "The *Anniston Star*, Anniston Ala., somehow obtained figures from the FDA which showed unusually high levels of PCB in fish samples taken from Choccoloco Creek. A *Star* reporter," he noted, "contacted the Anniston plant



for comments on the data and information about our PCB production operations there.” John was pleased by the way that the Anniston plant management was able to convince “the reporter to visit the plant for a firsthand view of what the plant was doing to eliminate PCB escape to the environment.” He especially pleased by the result:

A factual front-page feature appeared in the *Star’s* Sunday, November 22, edition reflecting the value of cooperation with news media planning PCB stories. Quoting both plant management and the Alabama Water Improvement Commission, the feature emphasized the PCB problem was relatively new, was being solved by Monsanto and, at this point, was no cause for public alarm [146].

But such stories indicated the minefield that Monsanto was navigating, especially as the company learned of the continuing pollution problems at the Anniston plant. In a memo from Papageorge to J. R. Savage at Monsanto’s General Office, Papageorge reported on the continuing environmental pollution problems plaguing the Anniston plant: “One very important objective of our PCB environmental control program was to control the losses of PCB in our plants to achieve a maximum of 50 ppb in the waste water effluent by 1-1-71 and 10 ppb by 9-1-71,” he noted. But, “during the month of September, Newport [Monsanto’s facility in the United Kingdom] reported an average of 246 ppb. During November Anniston reported 1410 ppb and the Krummrich Plant reported 495 ppb.” He emphasized that “because of the seriousness of the PCB problem this level of performance cannot be allowed to continue. I do not recall that any of the plants have been denied a resource they requested to achieve the stated objectives.” “We do not have the luxury of unlimited time to combat this problem,” he remarked. “What do we need to reduce losses quickly?” [147]

Limiting damage to the environment and to the company: 1971–1975

This section explores the growing crisis that Monsanto faced as the dimensions of environmental pollution expanded and as questions arose about the impact of this pollution on human health.

Despite all the efforts to limit environmental damage, Monsanto continued to produce PCBs and even to consider developing highly chlorinated Aroclors. In an internal memo from January 1971, one official expressed his concern about this prospect, given the haunting history he recalled of the early chloracne outbreaks in the 1930s:

When I learned at our meeting today that we might begin to produce Aroclor 1272, I thought that I should pass on to you some of the things I heard years ago about production of highly chlorinated Aroclor, either 1270 or 1272. I have been told that about 1930 (Swann) Aroclor 1270 or 1272 was produced in our Aroclor department in Anniston. The people who were directly involved in the production of this product began to break out in a rash after some period of



time. Later sores began to show up on the face, neck, arms and body of these people. Medication did not seem to have much effect on these sores.

He related that “This operation apparently did not last too long and these people were transferred to other jobs, however their condition did not seem to show much improvement even with the medical treatment prescribed.” He went on,

After possibly three or four years, several of these people sued the company and they were awarded several thousand dollars each. I believe \$5000 was the most any one received. I remember four of the people filing suit. Their names were Craig Slaughter, Ollie Slaughter, James Hartsfield and a man named Henderson [148].

Also in January 1971, Monsanto began to understand how difficult it would be to reach their “target of 10 ppb of PCBs in our plant waste streams which we expected to achieve by the third quarter 1971.” Papageorge explained that “during the year as the plants gained tighter control of known sources of PCB pollution it became increasingly obvious that high levels would continue because of the PCBs trapped in the oil and the sewer systems.” He pointed out how expensive achieving such a goal would be, arguing that “Clean-up of these sources can be economically impractical.” The reason for his gloomy outlook was that the company’s hopes for cleaning up the streams in Anniston would provide a method for “removing PCBs from isolated small waste streams.” But the problem was much bigger than this, for “it appears that the PCB contamination is so widespread that all of the plant’s effluent must be treated. This would result in a system more complex and costly than anyone had anticipated and approaches tertiary treatment which at W.G. Krummrich plant is scheduled for completion by 1973.” Papageorge proposed new goals: “For 1971 I am proposing that 1 lb per day of PCB in the water effluent be achieved in our plants by Sept. 1972 and 1 lb per day to the atmosphere by year end. These are levels which I believe the regulatory agencies might tolerate” [149].

In mid-1971, Monsanto reviewed the toxicological studies “being carried out at Industrial Biotest Laboratories under sponsorship of the Monsanto Company.” In a private memorandum, the Deputy Head of the Division of Toxicology concluded that “the summary of data to date indicates several areas of concern.” He pointed to the studies of dogs, rats, and chickens exposed to Aroclors 1242, 1254 and 1260 and the “primary” area of worry was “the apparent effects on reproductive processes of the PCBs.” He noted that “while results vary for the three Aroclors studies, for the 1242 effects on hatchability were noted at levels as low as 4 ppm in the diets of parents. For the rat decreases of litter size or increases in stillborns are seen at levels of 100 ppm in parents fed 1254 and 1260.” He fretted that “It is possible that successive generations may show an increased severity in effect.” The results gave him reason to be troubled, for they undermined any serious effort to develop adequate standards for controlling contamination.

Our conclusions at this time are that pending completion of studies in progress we are in a poor position to recommend guideline levels for contami-



nation. This lack of complete toxicological data when coupled with our essential lack of information about background levels of contamination in foodstuffs in general, make it all the more imperative that we resist setting guidelines on anything more than a case by case basis at this time [150].

This might have been especially disheartening to Monsanto officials as they believed that the company possessed “probably the world’s best reference file on the PCB situation. This includes reprints from the literature beginning in 1935 to reports issued last week” [151].

In late July 1971, there was a spate of bad publicity that began when the *Washington Post* reported that “a ‘significant proportion’ of the chickens raised in 12 states have been contaminated with a DDT-like compound.” The U.S. Department of Agriculture reassured consumers that it had “‘no evidence’ that any of the birds have reached consumers” but the article went on to identify the contaminant as PCBs. The chickens had been found to have high levels of PCBs in their tissue as a result of contamination of fish meal that was “caused by leakage of PCB being used as the heat exchange mechanism in a sterilizing machine” [152, 153]. Several days later the *Washington Post* reported that “millions of chickens fed on fish meal contaminated with a DDT-like chemical had been sold in stores in the Washington area and much of the rest of the country” [154, 155].

In early August 1971, the Senate Commerce subcommittee on Energy, Natural Resources, and the Environment made public a report from the Alabama Department of Conservation that “showed that polychlorinated biphenyls, known as PCB, in amounts as high as 360 parts per million, or 72 times the guideline set by the Food and Drug Administration, had been found in various species of fish.” Dr. Robert Risebrough testified before the subcommittee that “such chemicals had ‘become widespread pollutants in the global environment’.” He advised against “eating those fish.” An article in the *New York Times* noted that Monsanto had withdrawn PCBs “from the market except for use in closed systems, such as electrical equipment systems and heat transfer units in which the chemical is used as a coolant.” Despite Monsanto’s assurances that such “closed systems” were safe, it is apparent that it was such a “closed system” that polluted the feed that ultimately ended up in the meal for the contaminated poultry. “Holly Farms of Wilkesborough, North Carolina found that its hatching of eggs had been impaired. It traced the trouble to the fishmeal, and notified the federal agencies. Holly Farms then destroyed about 88,000 chickens” [156]. In an earlier article reporting on the contamination the number of chickens destroyed was estimated at 77,000 [157]. Also, in 1971, Campbells Soup found that it had 180,000 lb of contaminated chicken that it had to destroy [158].

A subsequent article in *Science* revealed that the contamination of the fish meal had been “detected only after the hatchability of eggs from chickens fed the meal began to diminish alarmingly.... Although the leak began in late April 1971, PCBs were allowed to drip into the fish meal until the defect was discovered in mid-July. In the intervening period of two and a half months, approximately 16,000 tons of fish meal had been distributed to more than 60 companies in ten states.” In mid



August 1971, after consumer activist Ralph Nader pressed the FDA to investigate, and the Agency

revealed that it had seized over 75,000 eggs because tests had detected excessive amounts of PCBs in eggs from chickens that had consumed the contaminated fish meal. On 16 August – a month after the leak was detected—USDA took its turn and ‘detained’ more than 50,000 lb of frozen-egg products in which the level of PCBs was high.

Nader and Representative Ryan were not satisfied with the government’s actions and “conducted their own ad-hoc investigation and to their dismay, discovered that contaminated eggs had reached the consumer. The FDA, on 18 August, confirmed that a shipment of 60,000 contaminated eggs had reached the retail market and apparently been consumed in the Washington D.C. area...” *Science* magazine pointed out that

PCBs intrusion into the environment is difficult to regulate because of a lack of federal laws and because no one is quite sure how much PCBs had been produced. EPA [US Environmental Protection Agency] and FDA officials point out that at present, they have no legal authority to halt Monsanto’s present uses of PCBs. Last year PCBs in pesticides were banned by USDA Pesticide Regulation Division, now a part of EPA. According to a spokesman, FDA has, in the past, indicated to Monsanto that it would not allow PCBs to be used in food as an additive [159].

In the midst of the chicken and egg controversy, Representative Ryan announced a broader bill than his previous one that would “ban all use of a DDT-like compound that has contaminated human and wildlife food chains in the U.S. and around the world.” Ryan’s congressional aide said, “this latest case convinces us there is no safe way for the stuff to be used.” Monsanto responded that “the use of PCBs is ‘absolutely essential’ for heavy electrical equipment and that the company had taken ‘very stringent measures’ to control use of the compound.” Further, the company announced that the previous year (1970) in August, Monsanto had

withdrawn PCBs from sale for any purpose other than as the insulating fluid in electrical capacitors, as a coolant in transformers or as a fire-resistant ingredient in industrial heating and cooling systems. The embargo also applies to the United Kingdom in which Monsanto also has a monopoly in PCBs.

The *Washington Post* cited the April 1971 *New Scientist* and *Science Journal* for its statement that “Monsanto’s recognition of PCBs as an ecological hazard and its voluntary ban on their use except in ‘closed-system’ equipment is very nearly unique in industry” [160].

At the same time that the drama was unfolding in Washington, Monsanto’s pollution control engineer received a report from two consultants who were studying “the PCB residue data” of Choccolocco Creek, the Coosa River, and tributaries.



The consultants did not have good news for the company: “considering the favorable publicity Monsanto Company recently received as a result of the congressional sub-committee report, we felt it imperative that we submit an interim report to Monsanto Company.” They reported that “We must conclude that for Analysis I that no improvement in fish residue levels, all species combined, is indicated.” For the second analysis, “the results are not good since both analyses show us that Aroclor 1254 residues have not decreased as we had hoped they would. Considering the residual nature of PCBs we were certainly optimistic to say the least.” The third analysis showed that with regard to “each of five fish species ... [in] each instance the residue levels were higher in the experimental area than in the control area. ... At this point we would have to say that the data are detrimental to Monsanto.” Their fourth and final analysis warned that “In the future we must be able to demonstrate considerable decreases in residue levels here if we are to show environmental improvement” [161].

The researchers had been following the effects of PCBs on fish in the area for a number of years and had found “that the greatest number of deformed fishes have been found at Marth Williams (Station 7) and stations immediately below 7. We also see the greatest number of fishes that are either sick or listless in these areas.” While it was difficult to ‘prove’ the causes of the deformities and problems faced by the local fish, the researchers knew that something was very wrong: “Of course visual observations won’t tell us what caused these fishes to become deformed or sick but we must consider the total observations as a crude indication that something is indeed wrong in these areas.” The data were damning: “In summary, there is nothing we can do with the residue data at this point that would allow Monsanto to counteract the unfavorable public opinion that may result from the congressional sub-committee report (which we have not seen).” They held out the hope that “perhaps the June 1971 data will show a decrease that is not apparent at this point—we can only hope that this will be the case” [161].

They also suggested

one additional aspect of the problem that might allow Monsanto Company to derive some favorable publicity. It is our impression that your plant data will show that the plant effluent has been cleaned up tremendously and that on a pound for pound basis you are putting very little residue into Choccolocco Creek at the present time in comparison with past years.

They concluded that they “are very sorry that we can’t paint a brighter picture at the present time. However, we all know that we have to study these situations carefully and that we must be able to document any claims of environmental improvement before they are released for public consumption” [161].

The unfavorable publicity and the bad news they were receiving about the impact of residual PCBs on fish and other animals led Monsanto to consider changing its “strategy on Aroclor 1221 in view of the increasing number of PCB episodes and the potential involvement of this product.” They had previously believed that Aroclor 1221, because it was less chlorinated than 1254 and other Aroclors, “was not a key offender on the PCBs found in the environment and, as



such, we elected to continue to sell direct and in plasticizer blends. This is still the policy in force today.” As part of their plan to clean up the Anniston plant, H.S. Bergen, Director of the Special Products Group at Monsanto, noted that the company was “planning to move production of Aroclor 1221 from Anniston [Alabama] to Krummrich [St. Louis plant] so there will be no more liquid PCBs of any variety made in Anniston.... This will cost us a considerable amount of extra freight money for plasticizer blends but we feel it is the best political and practical solution to this problem.” They acknowledged that they had a substitute—MCS 1109—which was “considerably more ecologically safe than Aroclor 1221 and more biodegradable.” Bergen asked “is it now time to decide to convert Aroclor 1221 to MCS1109? Or, should we wait until after the FDA/Dr. Berger meeting?” [162]

In September 1971, *The New York Times* (*NYT*) reported that the President’s Office of Science and Technology and the President’s Council on Environmental Quality had formed a study group “to investigate the presence of PCB in food and other compounds.” The EPA and representatives of Departments of Commerce, Agriculture, Interior and the Food and Drug Administration were described by the *NYT* as “expressing increasing concern over the possible health hazards of a colorless, odorless liquid named PCB.” In describing why the Interagency Taskforce had been set up, William D. Ruckelshaus, the Administrator of the EPA, told the *NYT* that “‘it is the sudden accumulation of information about PCB that gives us concern because it is used so widely in the environment’.” Monsanto was cited by the *NYT* as being in the process of “conducting a two-year study of the effects of the chemical on rats and dogs. A company spokesman said that no ill-effects had yet been detected” [163]. This was in spite of an internal memorandum from H. Blumenthal, Monsanto’s Acting Deputy Director, Division of Toxicology to Leo Friedman, Director, Division of Toxicology which spoke of the company’s observations that the Industrial Biotest studies sponsored by Monsanto of dogs, rats, and chickens indicated numerous reproductive problems including reduced litter sizes, reduced “hatchability,” and increased numbers of stillborn pups [150].

At about the same time the National Academy of Sciences appointed a special panel headed by Dr. Edward D. Goldberg, a chemistry professor at Scripps Institution of Oceanography at La Jolla, to examine the PCB problem as well. While acknowledging that there was some reason why companies would want to protect trade secrets, Goldberg pointed out that the National Academy of Sciences panel “also feel that there are times when it is not in the public interest for government to maintain as privileged data that are necessary for research into the state of our environment and for an assessment of its condition” [164]. By the end of September, all this publicity led Monsanto to agree to “stop selling” PCBs “to food and feed processing plants” [165].

In October 1971, Monsanto learned from an EPA scientist, Renate D. Kimbrough, about disturbing new studies that indicated rats fed Aroclor 1260 had developed “malignant anaplastic carcinoma of the bladder” [166]. Other studies continued to document environmental effects [167].



The end of 1971 was a busy time for the Monsanto PCB group. And Papa-george, the coordinator of the response to the PCB crisis, acknowledged that

It is the Company's position with respect to possible PCB contamination of the Environment that our responsibilities should and do include not only consideration of our employees, [sic] shareholders and customers but also consideration of all other persons who may eventually be affected by such contamination [168].

In addition, Monsanto noted its on-going problem with leaks from the storage drums used to transport PCBs to their customers. Benignus was aware that even the transportation of PCBs was a source of continuing pollution. Benignus quoted a letter from their representative in Brazil: “All Monsanto customers are complaining that too many drums arrive leaking. They state that our drums are much lighter than the German drums. This means that we use a too-thin walled drum more easily punctured.” Benignus complained that this had been a problem for “many years”:

I don't know for how many years now I have reported that our drums are inferior to our competitors' packages both from the standpoint of strength and quality.... More recently we have emphasized that the PCB pollution problem does not allow us to take liberties with leaking drums domestic or international. This drum thing has been in the mill a long time. For reasons given above we must now act [169].

In early 1972, there was growing attention to the environmental pollution caused by PCBs. In an article published in *Science* in January 1972, Allan Hammond, the research news editor at the magazine, noted that unlike DDT, PCBs “were seldom deliberately released into the environment.” This raised a new and problematic situation for scientists, policymakers, and industry alike. PCBs

presence and persistence [in the environment] reemphasize the likelihood that any widely used industrial chemical may become an environmental pollutant, and increase the responsibility for public disclosure of production quantities and use patterns when similar situations occur in the future [170].

The seriousness of the problem can be gauged by the fact when the National Institute of Environmental Health Sciences (NIEHS) at Research Triangle Park, North Carolina launched its journal, *Environmental Health Perspectives*, it devoted the entire first issue to, in its words, “the extent of the PCB story.” In devoting its first issue to PCBs, the journal editors said that “our hope is that this volume will contribute a new perspective to the study of PCBs and will help as well to engender a renewed vigilance about other ‘inert’ chemicals which are so pervasive a part of the environment of man.” The articles included in the issue were “originally prepared for a conference on PCBs, sponsored by NIEHS at the request of an interdepartmental taskforce on the subject.” The conference was held in North Carolina on December 20–21, 1971 [171–179].

By early 1972 Monsanto was informing all of its affiliates that the Monsanto Board of Directors had approved the “discontinuance of sales of polychlorinated



biphenyls and terphenyls for certain end uses in the domestic market.” In a note to executives of Monsanto affiliates throughout the world, Edmund Greene, from Monsanto Industrial Chemical Corporation headquarters in St. Louis, explained how company representatives should address the concerns of its customers. He pointed out that some might be upset that they were “being put to a lot of expense and trouble by our decision.” But, “in our personal contacts, you must convince him that we sold him material in good faith, and that only the most compelling reasons have forced us to this decision. But ultimately conversion and disposal are *his* problem. You should be helpful but avoid accepting any direct responsibility for successful conversion and safe disposal. The stakes are simply too high for us to accept any such risks” [180].

He also warned of the risks involved in promising too much to customers concerned about proper disposal of the PCBs they had purchased, especially for overseas buyers. “We also cannot offer overseas the disposal service offered in the US, and it is doubtful that the kind of high temperature incineration (2000F) facilities necessary are available in your areas.” Monsanto would not accept responsibility for the disposal of their customers’ PCBs:

The business group has agreed to prepare a description of suitable disposal techniques for the guidance of your customers as far as this may be possible. We certainly cannot accept responsibility for supervising each customer’s disposal, but we will try to tell him methods to avoid, at least. Obviously, he should avoid sewerage, any possibility of contamination of water supplies, feeding areas for wildlife, open dumps where scavengers might have access to the fluids or materials or containers which have had contact with the fluids.

Finally, he suggested that “your customer would find himself in the most secure legal position if he seeks out and follows the advice of local authorities.” He cautioned the representatives that they needed to make sure that customers understood the seriousness of their efforts by avoiding any appearance that this was a “sales gimmick” for new alternative Monsanto products: “recommending another Monsanto fluid simultaneously with the withdrawal of the FR series might make the whole exercise look like a sales gimmick,” he noted, “and dilute the sense of urgency we wish to convey to our customers” [180].

Monsanto decided to continue to sell PCBs for specialized uses in closed systems, including to General Electric which depended on PCBs “because of certain desirable flame resistant and insulator properties.” Monsanto, however, sought to insulate itself from any legal liability for damage done to humans, animals, or the environment and asked General Electric to sign a contract holding Monsanto harmless in case of future problems. The contract stated that General Electric “acknowledges that it is aware and has been advised by Monsanto that PCBs tend to persist in the environment, that care is required in their handling, possession, use and disposition; that tolerance limits have been or are being established for PCBs in various food products.” It continued,



Accordingly Buyer hereby covenants and agrees that with respect to any and all PCBs sold or delivered by or on behalf of Monsanto to Buyer on or after the date hereof and in consideration of any such sale or delivery, Buyer shall defend, indemnify and hold harmless Monsanto, its present, past and future directors, officers, employees and agents, from and against any and all liabilities, claims, damages, penalties, actions, suits, losses, cost and expenses arising out of or in connection with the receipt, purchase, possession, handling, use, sale or disposition of such PCBs by, through or under Buyer, whether alone or in combination with other substances including without implied limitation, any contamination of or adverse effect on humans, marine and wildlife, food, animal feed or the environment by reason of such PCBs [181].

All these agreements and decisions were taking place in a rapidly evolving US political environment. As indicated above, in 1971 the federal government, under pressure from environmental groups, Representative William Ryan of New York and others, established the Interdepartmental Task Force (ITF) consisting of representatives from the Departments of Agriculture, Commerce, Health Education and Welfare, Interior, as well as the EPA. In May 1972, it issued a 181 page report that recommended that PCBs be “restricted to essential or nonreplaceable uses which involve minimal direct human exposure.” The EPA reported that “it would curb industrial discharges of PCB” [182].

The Report described the “ubiquitous” contamination of the environment that was caused by the open burning or incomplete incineration of solid wastes, municipal, and industrial wastes, the vaporization from paints, coatings, plastics, etc., the discharge into municipal and some industrial sewers, accidental spills or improper waste disposal practices, the direct application to the environment as ingredients of pesticides or as carriers for pesticides, the dumping of sludge, solid waste on land and at sea and the migration from surface coatings and packaging materials to foods and feeds [183]. Newspaper reports continued throughout that spring, summer, and fall on the continuing environmental and consumer impacts of PCBs. PCBs were being found in food, rivers, fish and feeds [184–189].

Meanwhile, Monsanto continued to get bad news about the contamination of fish in the creeks surrounding the Anniston plant. In June 1972, Royal Suttikus and Gerald Gunning, biological consultants, told Monsanto that “it [was] obvious that the fishes below the source of PCBs in Choccolocco Creek have concentrated the residue to a greater degree than those fishes resident upstream from the source.” They concluded that “the data for the first year of the survey indicate clearly that the fishes below the Monsanto outfall have concentrated the PCB residues to a very high level.” They continued “to find deformed, sick, and lethargic fishes in our collections particularly at Stations 7, 8 and 10. Since the residue levels are highest at these stations, it is apparent to us that there is a cause and effect relationship,” and “the residual nature of PCBs complicates the environmental problem, as well as the very large quantity of PCBs that have been added to Choccolocco Creek in past years” [190].

Monsanto closed the Anniston plant on May 1, 1972 [191] and less than a year later found significant improvements in the ecology of the Choccolocco creek: “The September 1972 data reflect a very significant decrease in PCB residue levels, more



than I had ever hoped for quite frankly—I was indeed surprised to see such a tremendous drop in such a very short time,” reported Gerald Gunning. In his report to Monsanto, Gunning noted,

As stated many times previously Consultants have found a rather large number of deformed fishes below the point of effluent discharge, as well as many fishes that were hemorrhaging or exhibiting various degrees of nervous system damage. These instances are on record at the Monsanto plant, Anniston. Since these fishes are found in parts of the stream that were characterized by high PCB levels, one must admit the possibility that debilitation is due directly to PCBs or to other products manufactured to Monsanto Company [192].

As Monsanto became more concerned about the environmental impact of PCBs, it faced the problem of disposal. Incineration was their first choice but the limited number of appropriately equipped incinerators and the difficulty of transporting and paying for the incineration itself, meant other methods of the disposal were also considered. At the International Dielectrics Symposium in September 1974, W. B. Papageorge talked about the disposal of PCB materials in both liquid and solid form. He spoke of the fact that liquids “can be handled by (1) Chem-Trol Pollution Services, located in and headquartered in Model City, N.Y., (2) Rollins Environmental Services ... in Wilmington, Delaware.” Papageorge acknowledged that for solid PCBs “landfills are a reluctant second choice for disposal.” One major problem with both incineration and landfill disposal was transportation. E.M. Potter acknowledged “Problems occurred with the bottom of drums collapsing on long hauls about three years ago. Spillage could cause food contamination” [193].

Meanwhile, Monsanto continued to document the damage to fish pulled from the Choccolocco Creek in Alabama. At one location, their biological consultants found a goldfish with “a deformed stub” where a fin should have been and a skull with “the eyes... popping out of the sockets.” “In general,” the consultants explained, “the goldfish, when we lifted them from the net in the field, hemorrhaged from the gills. We have observed this in the field on many other occasions, in the past years of course.” The consultants concluded that “The goldfish feeds off the bottom and hence is particularly subject to picking up larger amounts of PCB residues.” Despite the fact that the Anniston plant had stopped producing PCBs for over two years at this point, the consultants found that “In summary, we would have to say that we did not find any more or any less abnormalities than in previous years of the survey” [194].

In October 1974, the National Institute for Occupational Safety and Health (NIOSH) was concerned that studies to “evaluate long term health effects in humans from either acute or chronic exposure to PCBs are not available” but that research showed that PCBs caused “serious impairment of the functions of the liver” and “a recent article by Mobuyuki, Nagoski, et al.... suggests PCBs are carcinogenic in animals.” NIOSH wrote to Emmet Kelly at Monsanto suggesting a meeting “to discuss the inclusion of PCB-exposed active and inactive workers at Monsanto in a planned retrospective cohort study” [195].

Less than six months later, in March 1975, Monsanto responded to a list of questions from Westinghouse about the coolant Inerteen, a product containing PCBs that



Monsanto had sold them. Papageorge told the staff supervisor at Westinghouse Electric Corporation he could not “overemphasize the need to properly control the use and handling of Inerteens to prevent their escape into the environment.” Although Papageorge “emphasized” that “over 40 years of experience” had shown “no human harm,” and that “the proper handling of Inerteens should pose no environmental or human health problems, permitting society’s continued use of a very valuable material,” he laid out the very real dangers that PCBs represented for people and the environment. He warned that “the polychlorinated biphenyls in Inerteen can have permanent effects on the human body,” and that there was a dose response relationship. “In general,” he argued, “a single exposure for a few minutes to atmospheric concentrations that cause irritation to the eyes and/or respiratory tract would not be expected to cause either the skin eruptions or demonstrable liver injury. The problem arises from repeated and prolonged exposure to atmospheric concentrations in excess of the accepted Threshold Limit Levels or repeated and prolonged skin contact” [196].

And yet, the information Monsanto had about possible exposure routes was troubling and led to real problems: “Animal data and human experience indicate that the toxic effects are similar whether exposure results from ingestion, inhalation of vapors, or absorption of the liquid through the unbroken skin.” These exposures, in turn, could have “potential toxic effects in humans from excessive exposure to polychlorinated biphenyls includ[ing] injury to the liver and chloracne.” Westinghouse posed a difficult question. “Since Inerteen affects birds and other animals, if there is no real effect to human beings, how do you explain it to employees in such a way that they will understand why it can kill a bird and not a human?” to which Papageorge responded, “There is potential real effect to humans.” But, he argued that it was possible to explain that birds might have a more serious reaction to the PCBs:

Due to differences in metabolism of food (and food contaminants) in birds and humans (and particularly the difference in the reproduction process in birds and mammals – including humans), birds are particularly sensitive to many chlorinated hydrocarbons including polychlorinated biphenyls [197].

Death Knell for PCBs: the controversy over cancer, 1976-1980

Underlying the efforts to control environmental pollution was the implication that PCBs, once in the environment, would affect human health. This section describes the fear that PCBs were carcinogenic and Monsanto’s efforts to allay or even deny academic studies that raised this possibility. The passage of the Environmental Protection Act that established the EPA, and the increasing attention to industrial pollution as a cause of cancer in humans, raised the prospect that Congress would pass, and the EPA would enforce, laws that would limit if not ban PCBs. Along with the enormous negative publicity that was attaching to Monsanto’s name, these federal initiatives led Monsanto to terminate production of PCBs in 1977 in the United States.



While Monsanto had acknowledged that PCBs were an environmental threat to birds, shrimp, and other wildlife and that they also were a liver toxin and an acute threat for skin disorders, its management still hoped that PCBs would not prove to be a human carcinogen. Industrial BioTest, the organization with which Monsanto had contracted to conduct animal studies of Aroclor 1260, reported in March that while Aroclor 1260 “appears to be slightly tumorigenic at levels of 100 ppm when fed continuously in the diet for 2 years,” [197] IBT also concluded that “Aroclor 1260 does not appear to be carcinogenic in rats fed for two years at levels up and including 100” [198].

This distinction between “tumorigenic” and “carcinogenic” was controversial because other studies identified PCBs as carcinogens. IBT laid out the scientific debate over what constituted a carcinogen that was then evolving, and told the company that “we are prepared to assist Monsanto in any adversary situation in and out of government.” IBT was concerned because an investigator, Dr. Renate Kimbrough, a physician with the Centers for Disease Control in Atlanta, had conducted a toxicological study that concluded PCBs were carcinogens. Other investigators who conducted toxicological studies of PCBs identified pre-cancerous “nodules” that may or may not develop into cancers. The problem for Monsanto was that the field of toxicology was itself undergoing a rapid change in its view of what constituted carcinogenesis. “Workers in the field have published extensively on the pathogenesis of hepatocellular carcinoma in recent years and the concepts have undergone considerable changes since the preparation of the final BIO-TEST report on chronic oral toxicity studies,” J. C. Calandra, the President of BioTest, reported to Monsanto. As recently as the early 1960s, for example, “studies on Aramite... postulated that hyperplastic nodules were transformed into hepatocellular cancer; however, this concept was not generally accepted by the scientific community.” But, this was changing. Calandra cited “an excellent paper” in the *Archives of Pathology* in 1974 that “‘highlights some newer developments of our understanding of liver carcinogenesis’.” But Calandra warned that

If the concepts presented in this paper as well as those of Squires, Saffioti [the head of the National Cancer Institute] and others are accepted, a number of substances would have to be reclassified as liver carcinogens. Carried to extreme, we could argue that any substance that results in stimulation of liver microsomal enzymes or possesses a hepatocytotoxic properties to any degree is a potential liver carcinogen [199].

IBT sought to hold the line to maintain a narrow conception of carcinogenesis. While BioTest’s “position was and remains that the PCBs were not shown to be liver carcinogens in its studies,” it “has no means at its disposal to dispute the findings of Kimbrough that Aroclor 1260 in female Sherman rats is a liver carcinogen except on the basis of experimental design” [199].

In the 1970s and 1980s, Industrial BioTest was exposed as being incompetent and possibly criminal. The trade association for the chemical industry, the Manufacturing Chemists Association, of which Monsanto was a member, did its own internal investigation on IBT’s research on vinyl chloride’s effect on rats, mice, and hamsters and concluded that “the study by IBT is scientifically unacceptable”



[200]. An MCA internal audit raised further suspicions about the integrity of IBT as a scientific research group, suggesting that their vinyl chloride study was “conducted in an extremely sloppy fashion” and that “foul play by IBT” was a possibility [201]. In 1983, these concerns became public when *Chemical Week* reported that over the years IBT had “systematically falsified test data collected on scores of drugs and chemicals.” The journal quoted one observer that IBT’s practices were the “‘most massive scientific fraud’ in American history” [202]. Monsanto’s dependence on IBT was certainly not helpful in future years.

Even the defense of PCBs as “slightly tumorigenic” was inadequate from Monsanto’s point of view. Monsanto wrote IBT, “In 2 instances [the reports on Aroclor 1260 and 1242] the previous conclusion of ‘slightly tumorigenic’ was changed to ‘does not appear to be carcinogenic’. The latter phrase is preferable. May we request that the AROCHLOR 1254 report be amended to say ‘does not appear to be carcinogenic’” [203]. IBT complied with Monsanto’s request [204].

A year later, in 1976, Monsanto received even more troubling news, as investigators at the University of Wisconsin reported on studies of monkeys exposed to PCBs. Paul L. Wright of Monsanto’s Department of Medicine and Environmental Health wrote to George Roush, Jr. now Monsanto’s Medical Director, about “Studies conducted under the direction of Dr. J. R. Allen, University of Wisconsin.” These found “specific toxicity manifestations following prolonged PCB administration to Rhesus monkeys. These reports have been used to support the conclusion that the subhuman primate is much more sensitive to PCB than is the rat. The greater sensitivity of man is implied,” Wright explained. “One toxic manifestation reported was impaired reproduction performance in the treated females....” Not only was reproduction impaired but “a no-effect level was not determined in the subhuman primate,” a fact that “may have future critical implications for Monsanto,” Wright worried in this internal assessment [205].

In the fall of 1975, concerns about PCBs in the environment made headlines in the leading US newspapers. The *Wall Street Journal*’s front page story, for example, captured the nation’s mood about the threat of PCBs: “Persistent PCBs; Industrial Pollutants May be Worse Threat than DDT to Ecology; They Linger Longer and are Toxic at Lower Levels Than Had been Thought; Sick Monkeys, Minks and Men.” The article detailed the nature of these “ubiquitous pollutants” which were “far more resistant than even DDT to degradation by natural forces.” PCB pollution was discovered “far from industrial plants” and one EPA official was quoted as saying “our overall concern about PCBs is greater than ever before.” That concern was based upon “the fact that a three-year-old voluntary restriction on PCB application has failed to reduce pollution.” The stakes were being raised said the *Journal* because, “as a result of the apparent failure of voluntary controls, environmentalists are urging a ban on PCBs.” Barry Commoner, the author of *Science and Survival* and other environmental science critiques, and Director of Washington University’s Center for the Biology of Natural Systems called “the lack of environmental caution in introducing PCBs ... ‘an absolutely shocking and staggering case history’.” The *Journal* also cited the “soon to be published study by Renate D. Kimbrough,” a toxicologist with the Centers for Disease Control, as providing “the strongest indication to date that PCBs can cause liver cancer in rats” [206]. The *Washington Post* noted the



EPA's concern that "PCBs are widely contaminating the environment ... three years after the government thought it had them 'well in hand'." [207]

Even though Monsanto was questioning Kimbrough's study, their own people at IBT agreed with her findings. At a meeting at the US National Cancer Institute (NCI) on January 31, 1975, attended by Kimbrough, two representatives of the NCI, two from IBT, and George Levinkas of Monsanto, they reviewed Dr. Kimbrough's study. The representatives of Industrial BioTest "reviewed sections of liver from all animals in the study." They concluded, "to a large extent, substantially the same type of lesions were observed in both [IBT's and NCI's] studies except that the lesions seemed to be more advanced in Kimbrough's study. Although there was some variation in terminology, the findings were reasonably close." Unambiguously, Levinkas wrote, "there were definite liver adenocarcinomas in Kimbrough's study. Dr. Richter [IBT] expressed the view later that two animals in our study approached the type of lesion Kimbrough had observed...." [208]. Levinkas saw this as a defeat: "as an observer, I wanted to get the reaction of BIO-TEST's pathologist before deciding what to do. There was no opportunity to caucus while at NCI. After we left, and they conceded the occurrence of hepatic carcinomas, there was little else to do" [208].

In November 1975, the EPA sponsored a three-day conference of over 400 federal, state, local officials, public interest and environmental organizations [209] in Chicago on PCBs where it was disclosed by Thomas E. Kopp, a chemist with the EPA's Office of Toxic Substances, that plants were discharging PCBs directly into rivers and streams in New Bedford, Massachusetts; Bloomington, Indiana; Sharon, Pennsylvania; Pickens, South Carolina; Pittsfield, Massachusetts; Fort Edward, New York; Hudson Falls, New York; and Totowa, New Jersey. In addition, Monsanto and another company were discharging PCBs into the sewage treatment systems of Sauget, Illinois, and Bridgeport, Connecticut [210]. The conference also heard that "perhaps 41–45% of all Americans had ... PCBs in their tissues" and that PCBs "had also been found in human milk" [211].

Two scientists from the EPA's ecological monitoring branch reported that that percentage had risen from 35.1% in 1973 [209]. On the final day of the conference in November 1975, Nathaniel Reed, the Assistant Secretary of the Interior, raised the stakes even further when he stated that "the Federal Government must impose a ban on the use ... [of PCBs] except in certain electrical equipment." He said that PCBs "should be confined to electrical transformers and capacitors" because "the nation's rivers and lakes were 'in mortal danger'" from PCBs. Even this limited use should be considered temporary and "all substitutes must be evaluated so that PCBs can be completely eliminated from industrial use." The Assistant Secretary continued, that he was "'deeply shocked by the pervasiveness by PCBs; they are literally everywhere'. He said he was 'very troubled by the exceedingly high levels found in fish from all our drainage systems'." [212]

Monsanto's internal memo regarding an EPA press conference the following month (December 1975) included "EPA's comment: PCBs are 20 times more persistent than DDT. They cause tumors in animals. They are laying in the environment, in the sediment in the bottom of lakes and rivers where they are like a delayed action time bomb waiting to go off. We may have to live with them for the rest of our lives" [213]. Around this time Canada reduced its allowable limit of PCBs in fish to two



parts per million forcing the FDA to consider lowering its allowable limits which stood at five parts per million [214].

Also in early December 1975, Dow Chemical “disclosed plans to market a new insulating fluid that it said could replace the controversial chemicals known as ... [PCBs], in high-voltage-power capacitors.” Dow estimated that this new fluid could “replace perhaps six to eight million of the estimated forty million pounds of the PCBs produced in the U.S. annually” [215]. The EPA-sponsored conference, according to the *Los Angeles Times*, helped to stimulate “a growing body of opinion that PCBs represent an increasing health hazard and should be banned entirely.” The *Los Angeles Times* noted that although the conference “took no formal stand on the ban of the chemical,” some organizations such as the National Fisheries Institute, Inc., the “lobbying organization for 550 companies that package and market seafoods” also endorsed “a total ban” [209].

By the end of 1975, Russell Train, the EPA Administrator, was calling for a voluntary ban on PCBs noting that although the EPA didn’t have “any authority to order that PCB use be discontinued,” it could “control their discharge into the nation’s waterways.” He was quoted by the *Wall Street Journal* as saying that “the public has to understand that we have a hell of a problem and nothing this agency can do will solve it for a long time” [216]. The *Chicago Tribune* quoted Train as describing PCBs as “a significant hazard to human health and the environment.” According to the paper, he “urged moving ‘toward totally eliminating the use of polychlorinated biphenyls (PCBs) as rapidly as possible’” [217]. Train called for dramatic actions in order to stem the problem of environmental pollution from PCBs. He noted that since the beginning of its production in 1929, there had been approximately, 700 million pounds of PCBs produced of which 300 million pounds still “remain in the air, water and soil.” PCBs, he noted, “caused tumors, skin lesions, gastric disorders and miscarriages in mammals.” He announced an “‘action plan’ to reduce levels of production and discharge and to seek an eventual halt of all production and use in the United States.” Train “directed EPA Regional Offices to crack down on PCB discharge by manufacturers and large scale users of the chemicals, and has called for voluntary self regulation by both groups” [218].

The tremendous public attention to PCBs and their impact on the environment in late 1975—and the calls for banning PCBs—led Monsanto to consider getting out of the PCB business entirely. The pressure was building. The Vice President and Managing Director of Monsanto’s Industrial Chemicals Company, Francis J. Fitzgerald, told the Chairman, President and Chief Executive Officer of Monsanto, John W. Hanley, of these mounting pressures. For one thing, “the EPA has called Chicago hearings with the idea of making Monsanto an example.” For another, Fitzgerald explained that “the issue is coming to a head because of a series of recent tests *tentatively* show PCB’s [sic] when building in animals apparently create a carcinogenic effect.” [Emphasis in the original] In response, Hanley asked Fitzgerald “to consider using the Corporate PR Department to make a judgment as to PCB’s [sic] adverse impact on Monsanto. The study should address the point as to whether we should get out of the PCB business as a deliberate move” [219, 220].

Six weeks later, the Monsanto “PCB Study Group” presented its report “concerning the past, current and future impact upon Monsanto’s image of PCB



manufacture.” Up to that time, the “negative impact... has been minimal measured against the highly visible environmental and political controversies which had occupied so much national attention in recent years.” But the news was not all good. “Negative environmental effects and/or potential health hazards always leave a residue of ill will with most audiences and publics and this negative reaction must be fully recognized.” The Study Group then asked the question “is the adverse impact now, or in the future, likely to be greater than the benefits derived from staying in the business?” [221]

In answer to this question, the Study Group noted that “the Toxic Substances [Control] Act will become law in 1976 and by year-end mechanisms will be in place to ban or restrict PCB use to closed systems.” Also, “additional lawsuits may well occur... [and] the fact of the litigation will help keep the controversy alive.” Continuing research will lead to “serious questions ... be[ing] raised in regard to the potential human health hazard and such medical and research data will build.” Earle Harbison, the General Manager of the Special Chemicals Division, learned that “media attention, which has fluctuated in the past 5 years, will remain high and constant. Monsanto’s customers will bear the brunt of the criticism; media pressure will build for strict control if not a total ban. Monsanto will receive an increasing share of the criticism in the absence of a publicly stated intention to withdraw from PCB manufacture. The Study Group concluded: “These conditions suggest, in answer to the question at hand, the negative impact on Monsanto’s image will, indeed, exceed the benefits derived from staying in the business.” They considered how, “during the period ahead to minimize the negative impact on Monsanto’s image.” The principal one was that “Monsanto must not be viewed as being forced into a decision to withdraw from PCB manufacture by either government action or public pressure. Rather, key audiences must perceive Monsanto as having initiated responsible action in a manner consistent with its past reputation and practices” [221].

In January 1976, Monsanto “announced today that it plans to phase out the manufacture” of PCBs. “F.J. Fitzgerald, a corporate Vice President, said he could not give an exact timetable for the phase-out but ‘it could be in a planned and orderly manner’” [222, 223]. Shortly after, in March 1976, the much anticipated Toxic Substances Control Act was passed by the Senate. It went to the House and passed in August and was signed into law by President Gerald Ford in October. Significantly, the Act empowered the EPA to regulate PCBs and other chemicals introduced into the environment, specifically saying “no person may manufacture any poly chlorinated biphenyl after 2 years after the effective date of this act and no person may process or distribute in commerce any polychlorinated biphenyl after two and one-half years after such date” [224]. A week before the Act was signed into law, Monsanto announced that they were ceasing production of PCBs on August 31, 1977 [225].

Despite Monsanto’s decision to phase out of the PCB market, and to allay the possible negative public relations and regulatory impact on the company, the Company continued its efforts to control the narrative about PCBs. In 1978, the National Cancer Institute reported the findings of a study of rats to assess the “possible carcinogenicity of Aroclor 1254.” The study animals were fed PCBs for about 2 years. The NCI reported “the combined incidences of lymphomas and leukemias showed a significant dose-related trend in males.... However, the direct comparisons with



each dosed group with those of the matched controls were not statistically significant, and the tumors cannot clearly be related to administration of with [sic] Aroclor 1254” [226].

The Report went on,

hepatocellular adenomas and carcinomas were found in the dosed groups, but not in the controls.... Additionally, a high incidence of non-neoplastic hyperplastic nodules were noted in the dosed animals.... Although the incidences of tumors were not significant, the occurrence of the hyperplastic nodules appeared to be related to administration of the chemical.

Further,

in the stomach, jejunum or cecum, adenocarcinomas were observed in two dosed females as well as a carcinoma in one dosed male. None of these lesions were found in controlled animals in this study. Historical incidences of these tumors at this laboratory ... suggest that the lesions – although not statistically significant – may be related to the administration of Aroclor 1254.

The NCI concluded,

that under the conditions of this bioassay, Aroclor 1254 was not carcinogenic in Fischer 344 rats; however, a high incidence of hepatocellular proliferative lesions in both male and female rats was related to administration of the chemical. In addition, the carcinomas of the gastrointestinal tract may be associated with administration of Aroclor 1254 in both males and females [226].

The NCI study was carefully worded to meet scientists’ criteria for asserting causation. Hence, their conclusions indicated that statistical causation “under the conditions of this bioassay” could not show absolute certainty. While there was evidence of a relationship between Aroclor 1254 and the development of tumors and even cancers, more research would have to be done to establish a statistically valid conclusion. Monsanto, however, wanted to use the study to say that the NCI had given Aroclor a clean bill of health insofar as cancer was concerned [227].

They prepared a press release that stated “NCI has determined that Monsanto’s PCB is not carcinogenic in a two-year animal feeding study.” Their own scientists, however, told Monsanto that it was inappropriate to make such a statement, given what the NCI itself had actually said. Peter E. Berteau of Monsanto’s Department of Medicine and Environmental Health, suggested that Monsanto’s statement about the NCI’s conclusion “should be avoided” and was “requesting advice from a statistician concerning some of the statements” in the NCI report. “You want to say what NCI said,” he pointed out, “not merely express Monsanto’s opinion.” If the statement were “released to the public,” he noted, it might generate objections from the NCI.” Monsanto’s interpretation of the study was “too strong” [227].



Berteau did consult a statistician, A.W. Dickenson from Monsanto's General Offices, who provided his assessment of both the NCI Bioassay and Monsanto's proposed statements about it. Dickinson wrote, "it is definitely not legitimate to state that 'NCI has determined that Monsanto's PCB is not carcinogenic'. All they have done," Dickinson explained, "is fail to demonstrate conclusively that it is carcinogenic. If we must make some statement, I would prefer your [Berteau] 'there is no conclusive evidence that PCBs cause cancer'." Dickinson was even more circumspect. "I would have some qualms about releasing this statement without the qualifying (p. 62) 'it is suggested that Aroclor 1254 may be a tumor promoter'." He concluded "perhaps the best position is to make no public statement." Dickinson explained the bar that statisticians set for claiming causation was high and that the fact that the NCI study did not meet the criteria, may have simply been because of the small sample size. "In view of the fact that the power of the individual comparisons is limited by the small group sizes, I would view the presence of the positive dose-related trend as a strong warning that the substance may be carcinogenic." In the handwritten note at the top of Dickinson's memo, one of the Monsanto people who received these reports wrote: "You sure these guys work for us?" [228]

Despite having solicited the opinions of their own in-house experts and having received very explicit warnings about what they could and could not say about the NCI study's conclusions, Monsanto's Director of Communications, Dan Bishop, saw fit to ignore their advice. In a letter to H.L. Stevenson, the Editor-in-Chief and Vice President of United Press International, the news service that distributed information and articles to hundreds of news outlets throughout the country and the world, Bishop complained about "stories treating the subject of PCBs [that] repeatedly referred to them as 'cancer-causing agents'." Bishop wrote that "according to no less an authority than HEW's National Cancer Institute, PCB is not a cancer-causing agent." He claimed that while environmental pollution was a real concern, his correction was "an honest attempt to set the record straight and avoid creating needless, unwarranted further alarm. You could aid us greatly in the endeavor by communicating this information to your bureaus" [229].

Bishop continued to try to allay concerns about PCBs relationship to cancer. In a memo to a group of Monsanto's public relations directors in October 1980, Bishop enclosed a memo, "PCB Hazards-Facts and Fallacies," that said "we circulated... widely, last week to local news media contacts in an all-out attempt to get them off the 'cancer-causing'/'deadly toxin' kick. And, I'm happy to report, with guarded optimism, that we're making some headway." The enclosure, a "Note to Editors from Monsanto Company," argued "the 'cancer-causing' label resulted from a single animal study conducted by a Public Health Service researcher in 1975—and later discredited by peer review. The cancer stigma has persisted, however, despite this and the results of a later animal study performed by the National Cancer Institute [226]. The conclusion of the NCI study was that PCBs *were not* cancer-causing compounds" [emphasis in the original] [230].

In an internal newsletter for workers at Monsanto's Krummrich plant that produced PCBs from the 1930s through the mid-1970s, Monsanto sought to calm workers' concerns about the material they worked with every day. One worker



had written to the editors that he “worked in aroclors department... for almost ten years. I am concerned about my health, because the newspapers describe PCBs as ‘human cancer-causing agents and deadly toxins’.” The newsletter addressed his concerns by reviewing a number of studies including the NCI study: “In April of 1978, the National Cancer Institute published a report of an animal feeding study in which laboratory rats were fed PCBs for 105 weeks.” The management once again misrepresented the data: “NCI concluded that PCBs were not cancer-causing compounds as a result of these studies” they calmly misinformed their workforce [231].

Looking backwards: 2018

The story of PCBs is the story of missed opportunities and Monsanto’s unwillingness to live up to its and US industries’ own stated principles. From early in the twentieth century, as the country became a major industrial power, industrial leaders promulgated certain rules of the road through their own trade associations. If this new industrial model was to function with minimal government regulation in a ‘free market’ economy, industry had responsibilities to the public that they could not forsake. Chief among them were industry’s obligation to maintain safe workplaces, test their products for safety, and to educate workers and the public how to use their products safely if there were intrinsic dangers [232]. The fact that virtually every human being in the United States, if not the world, now has PCBs in their bodies and the International Agency for Research in Cancer (IARC) now states unequivocally, “PCBs are *carcinogenic to humans (Group 1)*” [emphasis in the original] tells of the price we have paid for Monsanto’s decisions [233].

There are lessons for public health practitioners that can be gleaned from this history. First, we should be aware that when we introduce new chemicals into our environment, we have an obligation to make sure that we apply the fundamental principles of public health: that we need to test products before they are introduced into our environment and into our bodies. If we wait for final epidemiological or statistical ‘proof’ that a substance will be dangerous, it very well may be too late. As Bradford Hill famously said in lecture to the Royal Society of London in 1965, “All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time” [234]. Second, as a society we cannot entrust those with self-interests to be the judge and jury of what is and what is not a danger. As we learned here, that can only lead to compromised science, a questionable decision-making process, and a potentially polluted world.

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use,



distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

References

1. National Cancer Institute. Formaldehyde and cancer risk. <https://www.cancer.gov/about-cancer/causes-prevention/risk/substances/formaldehyde/formaldehyde-fact-sheet>. Accessed 8 May 2018.
2. Gross L. Flame retardants in consumer products are linked to health and cognitive problems. Washington Post. April 15, 2013. https://www.washingtonpost.com/national/health-science/flame-retardants-in-consumer-products-are-linked-to-health-and-cognitive-problems/2013/04/15/f5c7b2aa-8b34-11e2-9838-d62f083ba93f_story.html?noredirect=on&utm_term=.53e11018c13f. Accessed 8 May 2018.
3. CDC. National Biomonitoring Program, Biomonitoring Summary, “Non-Dioxin- Like Polychlorinated Biphenyls”. https://www.cdc.gov/biomonitoring/NDL-PCBs_BiomonitoringSummary.html, Accessed 10 Jan 2018.
4. Spears EG (2014). Baptized in PCBs: race, pollution, and justice in an all-American Town. University of North Carolina Press, Chapel Hill.
5. Greenburg L. Chlorinated naphthalenes and diphenyls. Ind Med. 12(Feb 1943), 520–522.
6. President. Monsanto to Stockholders: Announces “acquisition of the controlling interest in the Swann Corporation”. July 26, 1933. <https://cdn.toxicdocs.org/re/rer6Yz8dDkaV72LZLV18jm1Jq/rer6Yz8dDkaV72LZLV18jm1Jq.pdf>. Accessed 10 Sept 2018.
7. Swann Chemical Company. A brief description of the Aroclors. Feb 2, 1931. <https://cdn.toxicdocs.org/qa/qaL0x5YMZL16B2KaMo24OmDKK/qaL0x5YMZL16B2KaMo24OmDKK.pdf>. Accessed 13 Sept 2018.
8. Swann Use Codes. Jan 1, 1935. <https://cdn.toxicdocs.org/MG/MGVoRNV6zzv2jag30gmorLvoa/MGVoRNV6zzv2jag30gmorLvoa.pdf>. Accessed 10 Sept 2018.
9. Diphenyl and Chlorinated Diphenyl Derivatives. June 1935. <https://cdn.toxicdocs.org/ba/baaaYyD2zXZ2ednN3rMpo2q16/baaaYyD2zXZ2ednN3rMpo2q16.pdf>. Accessed 19 Oct 2018.
10. Report of Dr. Frederick B. Flinn of Patch Tests Made on Material Received from Swann Research, Inc. May 25, 1934. <https://cdn.toxicdocs.org/O3/O3bQLg07EgokJVZ77XOmgLxzX/O3bQLg07EgokJVZ77XOmgLxzX.pdf>. Accessed 10 Sept 2018.
11. David B. Peakall and Jeffrey Lincer (1970) Polychlorinated Biphenyls, Another Long-Life Wide-spread Chemical in the Environment, *Bioscience*, 20(Sept 1, 1970), 958.
12. PCB Presentation to the Corporate Development Committee. April, 1970. <https://cdn.toxicdocs.org/K6/K6ZYN6ormbxMavj944QxJVjjX/K6ZYN6ormbxMavj944QxJVjjX.pdf>. Accessed 10 Sept 2018.
13. Drinker Cecil, et al. The problem of possible systemic effects from certain chlorinated hydrocarbons. J Ind Hyg Toxicol. 19(Sept 1937), 283–311.
14. Drinker C et al (1937) The problem of possible systemic effects from certain chlorinated hydrocarbons. *The Journal of Industrial Hygiene and Toxicology*, 19(Sept 1937), 301.
15. Drinker C, et al. The problem of possible systemic effects from certain chlorinated hydrocarbons. J Ind Hyg Toxicol. 19(Sept 1937), 302.
16. Drinker C, et al. The problem of possible systemic effects from certain chlorinated hydrocarbons. J Ind Hyg Toxicol. 19(Sept 1937), 303.
17. Drinker C, et al. The problem of possible systemic effects from certain chlorinated hydrocarbons. J Ind Hyg Toxicol. 19(Sept 1937), 307.
18. Watt LA. Internal memorandum. Oct 11, 1937. <https://cdn.toxicdocs.org/3Q/3QmrvryBGyG9mMZdvd9yZ0Mwy/3QmrvryBGyG9mMZdvd9yZ0Mwy.pdf>. Accessed 10 Sept 2018.
19. Drinker CK. Report to the Monsanto Chemical Company. Sept 15, 1938. <https://cdn.toxicdocs.org/gb/gb1MarmweN6vgZ1LjkbjNLZJV/gb1MarmweN6vgZ1LjkbjNLZJV.pdf>. Accessed 12 Sept 2018.



20. Drinker CK. (1939) Further observations on the possible systemic toxicity of certain of the chlorinated hydrocarbons with suggestions for permissible concentrations in the air of workrooms. *Journal of Industrial Hygiene and Toxicology*, 21(May 1939), 158, 157.
21. Monsanto Chemical Company. Salesmen's manual, Aroclor. Oct 1, 1944. <https://cdn.toxicdocs.org/x5/x5vY9RVKoG8v4w0MoL8naJZgb/x5vY9RVKoG8v4w0MoL8naJZgb.pdf>. Accessed 10 Sept 2018.
22. Fairhall LT. *Industrial Toxicology*. Baltimore: The Williams & Wilkens Company; 1949. p. 256.
23. Strachan MN to Barrett JW. “Aroclor Toxicity Summary of References” Monsanto Chemicals Limited Inter-Office Memo (handwriting at bottom of first page: “Copies passed to Dr. Newman”. Aug 30, 1949). <https://cdn.toxicdocs.org/Qk/QkR612D7YGa1gR171BpyR26k/QkR612D7YGa1gR171BpyR26k.pdf>. Accessed 10 Sept 2018.
24. Wheeler EP to Richard WR. Aroclor degradation in soil. April 8, 1969. <https://cdn.toxicdocs.org/JJ/JJvkyeLmz5q8Gqx3E5j6G279K/JJvkyeLmz5q8Gqx3E5j6G279K.pdf>. Accessed 10 Sept 2018.
25. Manufacturing Chemists Association. “Legal Principles,” in *To Class A Members*, National Paint, Varnish and Lacquer Association. July 18, 1939. <https://cdn.toxicdocs.org/Lp/Lp4857a7Q99rBDQ3azOzB6RJQ/Lp4857a7Q99rBDQ3azOzB6RJQ.pdf>. Accessed 13 Sept 2018.
26. Manufacturing Chemists Association. Manual L-1: a guide for the preparation of warning labels for hazardous chemicals. *Chem Eng News*. 1945;23: 992–6, 1 (adopted 1945, revised April 1946).
27. Kaplan SA. “Development of Material Data Sheets,” paper delivered at the 191st National Meeting of the American Chemical Society, New York, NY, April 1986. <http://jrm.phys.ksu/safety/kaplan.html>. Accessed 4 Dec 2014.
28. Holden FR. What the foundation plant surveys are disclosing. IHF, *Seventh Annual Meeting of Members*, Pittsburgh, PA, November 10–11, 1942.
29. Smyth HF, Mellon Institute. Solving the problem of the toxicity of new chemicals in industry. *W Va Med J*. 1946;7(42):177.
30. Monsanto Chemical Company. Press Release. Oct 7, 1947. <https://cdn.toxicdocs.org/zd/zd2304q0gZL73rK3YL5zr3NpB/zd2304q0gZL73rK3YL5zr3NpB.pdf>. Accessed 10 Sept 2018.
31. Garrett JT. Toxicity considerations in pollution control. *Ind Wastes*. 1957;1–2:17.
32. Hueper WC. *Occupational tumors and allied diseases*. Springfield, IL: Charles C. Thomas; 1942.
33. Survey of Compounds which Have Been Tested for Carcinogenic Activity. Jonathan Hartwell, National Cancer Institute, abstracted in *Industrial Hygiene Foundation Digest*, 21, 1942, No. 467.
34. FOUND! Three Industries that can't use Aroclors. Monsanto ad, *Saturday Evening Post*, 1946. (P-343; P3242).
35. Monsanto Chemical Company. A guide for formulating Santobane, Monsanto DDT. 1951. <https://cdn.toxicdocs.org/O1/O1G53Y0V09OJJZB7Rxv1njGvQ/O1G53Y0V09OJJZB7Rxv1njGvQ.pdf>. Accessed 19 Oct 2018.
36. Benignus PG. Technical sales report. June 30, 1955. <https://cdn.toxicdocs.org/Y2/Y20b3ReRRpV7KvQ1eYNrGdqK/Y20b3ReRRpV7KvQ1eYNrGdqK.pdf>. Accessed 12 Sept 2018.
37. Sherwood LW, Monsanto, to Benignus “Aroclor Use to Increase the Insecticidal Life of Lindane”, Aug 30, 1957. <https://cdn.toxicdocs.org/M4/M4KD86NGVZbB0YeNbBQbDR9jM/M4KD86NGVZbB0YeNbBQbDR9jM.pdf> Accessed 10 Sept 2018.
38. Kelly RE. Medical director to Dr. Louis W. Spolyar, Director, Indiana State Board of Health, Division of Industrial Hygiene. Feb 14, 1950. <https://cdn.toxicdocs.org/k9/k9EaY2kRgwKNN14VGEVZ0eGMJ/k9EaY2kRgwKNN14VGEVZ0eGMJ.pdf>. Accessed 10 Sept 2018.
39. Monsanto. The handling of Aroclors (chlorinated diphenyl). <https://cdn.toxicdocs.org/06/065j8wyyB7nQ8vV5KN9mDb6LJ/065j8wyyB7nQ8vV5KN9mDb6LJ.pdf>. Accessed 10 Sept 2018.
40. Benignus PG to Smith TK Jr. Agreement between the U.S. Public Health Service and the manufacturers of chlorinated naphthalenes, chlorinated diphenyls and chlorinated diphenyl oxides, Feb 29, 1952. <https://cdn.toxicdocs.org/YG/YGM9MXyokEZnVJjkJ9Z6RJ9b0/YGM9MXyokEZnVJjkJ9Z6RJ9b0.pdf> Accessed 10 Sept 2018.
41. Richards HB Jr. “Report No. 2892, Interim Report on Aroclor in Gases” Research Department–Phosphate Division, Anniston, Alabama, June 17, 1953. <https://cdn.toxicdocs.org/VK/VKjgKJ4QoOYJ93eEDanN8p9YN/VKjgKJ4QoOYJ93eEDanN8p9YN.pdf>. Accessed 10 Sept 2018.
42. Wheeler EP to Mather E. “Aroclors: toxicity”. Sept 1, 1953. <https://cdn.toxicdocs.org/jm/jmKNq2VbxokweDbQyMOJ2y1Yp/jmKNq2VbxokweDbQyMOJ2y1Yp.pdf>. Accessed 10 Sept 2018.
43. Seven Workers Develop Chloracne in Plant Using Aroclor. Typescript copy of excerpt of JAMA article, from 1954. <https://cdn.toxicdocs.org/ga/ga9ydddbMRozdvLeVrGed91oe/ga9ydddbMRozdvLeVrGed91oe.pdf>. Accessed 10 Sept 2018.



44. Hamer WE to Barrett JW. Aroclor toxicity. Feb 27, 1954. <https://cdn.toxicdocs.org/e1/e1kywV7kvgy7Q59odw0YdQR6e/e1kywV7kvgy7Q59odw0YdQR6e.pdf>. Accessed 10 Sept 2018.
45. Kelly RE to Newman NR. Feb 12, 1954. <https://cdn.toxicdocs.org/b5/b5Y48nv2wB80KBVj6mk1B6q10/b5Y48nv2wB80KBVj6mk1B6q10.pdf>. Accessed 10 Sept 2018.
46. Report No. 2970, Final. Report on Aroclor in Gases, H. B. Richards, Jr, Research Department—Phosphate Division, Anniston, Alabama; “Confidential”. March 15, 1954. <https://cdn.toxicdocs.org/3B/3BJL9LYxN6B7zX8o69EN227D/3BJL9LYxN6B7zX8o69EN227D.pdf>. Accessed 10 Sept 2018.
47. Mather E. Process for the production of Aroclors, Pyranols, etc at the Anniston and at the Wm. G. Krummrich plant. April 1955—includes an excerpt from The Chemist Analyst, vol 36, pp 33 of the J. T. Baker Chemical Co., Phillipsburg, NJ, Sept 1947. <https://cdn.toxicdocs.org/k9/k96G32oKpn6zMvQdjX5qayDQE/k96G32oKpn6zMvQdjX5qayDQE.pdf>. Accessed 10 Sept 2018.
48. Kelly E to Barrett JW. London re, Aroclor toxicity. Sept 20, 1955. <https://cdn.toxicdocs.org/v1/v10vq2xmvvg6p61woxM3k8QKGB/v10vq2xmvvg6p61woxM3k8QKGB.pdf>. Accessed 10 Sept 2018.
49. Garrett JT to Patrick HB, Krummrich Plant; “Department 246 (Aroclors)”. Nov 14, 1955. <https://cdn.toxicdocs.org/dQ/dQVwkBkzx75p85Q89950Z34n5/dQVwkBkzx75p85Q89950Z34n5.pdf>. Accessed 10 Sept 2018.
50. Treon JF et al. The toxicity of the vapor of Aroclors 1242 and 1254. The Kettering Laboratory. June 22, 1955. <https://cdn.toxicdocs.org/G5/G5kLvqYjvwKpv5Ekp0X2RyXY4/G5kLvqYjvwKpv5Ekp0X2RyXY4.pdf>. Accessed 19 Oct 2018.
51. Treon JF, et al. The toxicity of the vapors of Aroclor 1242 and Aroclor 1254. Ind Hyg Quart. June 1956;17:204–13.
52. Litzsinger HS. Monsanto, St. Louis, to J.T. Garrett, St. Louis, Subject “Pydraul 150”. May 29, 1956. <https://cdn.toxicdocs.org/Ra/Rakn17nOBDMoE15KDjnNn1Gr8/Rakn17nOBDMoE15KDjnNn1Gr8.pdf>. Accessed 10 Sept 2018.
53. Kelly RE to Langenfeld FH. St. Louis, “Pydraul 150”. June 7, 1956. <https://cdn.toxicdocs.org/M4/M4XBy0yvj0ze55NkNgyJOa8ZM/M4XBy0yvj0ze55NkNgyJOa8ZM.pdf>. Accessed 10 Sept 2018.
54. Wheeler EF to Sido GR. Pydraul 150- U.S. Navy. Dec 26, 1956. <https://cdn.toxicdocs.org/15/1556ybx8K9ZM4GnobEVK0jd2d/1556ybx8K9ZM4GnobEVK0jd2d.pdf>. Accessed 10 Sept 2018.
55. Kelly RE to Armstrong HI. St. Louis, “Pydraul 150”. Jan 21, 1957. <https://cdn.toxicdocs.org/nk/nkYzag0mBQq7wexX7kN0nYM16/nkYzag0mBQq7wexX7kN0nYM16.pdf>. Accessed 10 Sept 2018.
56. Sido RS to Wheeler EP. Sept 11, 1957. <https://cdn.toxicdocs.org/zo/zopG487Q77BoGN0d2G5r8g4eg/zopG487Q77BoGN0d2G5r8g4eg.pdf>. Accessed 10 Sept 2018.
57. Wheeler E to Slayton PL. Toxicity of Pydraul 150. Sept 25, 1957. <https://cdn.toxicdocs.org/v1/v1gZLjObE3956r197MvV25L6Z/v1gZLjObE3956r197MvV25L6Z.pdf>. Accessed 10 Sept 2018.
58. Wheeler E to Lofstrom J. April 8, 1957. <https://cdn.toxicdocs.org/bB/bBzqYVJ6N34Jv0ed293EVpYr6/bBzqYVJ6N34Jv0ed293EVpYr6.pdf>. Accessed 10 Sept 2018.
59. Monsanto Technical Bulletin 0-124. Aroclor resins and plasticizers for chlorinated rubber. May 1957. Available at: <https://cdn.toxicdocs.org/Ed/EdB0JgEaondJQnyDXgz4jqRMN/EdB0JgEaondJQnyDXgz4jqRMN.pdf>. Accessed 10 Sept 2018.
60. Smith DF to Minter BA. Pydraul Labeling. Dec 5, 1958. <https://cdn.toxicdocs.org/6J/6JBbV0pgde12mrGdZL3XOVnm/6JBbV0pgde12mrGdZL3XOVnm.pdf>. Accessed 10 Sept 2018.
61. Kelly RE to Heasel OF. St. Louis. June 23, 1959. <https://cdn.toxicdocs.org/2N/2N2LJV6V7kOaVZ643V5Gw8vbp/2N2LJV6V7kOaVZ643V5Gw8vbp.pdf>. Accessed 10 Sept 2018.
62. Garrett J. Industrial hygienist, Medical Department to S. Facini, Engineering Dept, Chicago Pneumatic Tool Co. Aug 29, 1960. <https://cdn.toxicdocs.org/2j/2jnOe3n883vaGoXBb4QkvVQor/2jnOe3n883vaGoXBb4QkvVQor.pdf>. Accessed 10 Sept 2018.
63. Kelly RE to Davis R. St. Louis. Feb 2, 1961. <https://cdn.toxicdocs.org/wq/wqaGvXynaKpQmKJ8bKDYQXOX3/wqaGvXynaKpQmKJ8bKDYQXOX3.pdf>. Accessed 10 Sept 2018.
64. Allen JP. Hexagon Laboratories to Monsanto Chemical Co, St. Louis, Attn: Kelly. Feb 14, 1961. <https://cdn.toxicdocs.org/DG/DG9drRGoMnBEOzzJk61kZOEoQ/DG9drRGoMnBEOzzJk61kZOEoQ.pdf>. Accessed 10 Sept 2018.
65. Davis R to File, The Frito Company. Oct 18, 1960. <https://cdn.toxicdocs.org/oe/oebdGO1Yjbdor0pGX1j3MEJ3/oebdGO1Yjbdor0pGX1j3MEJ3.pdf>. Accessed 10 Sept 2018.



66. Shaw S. Monsanto, to Frito Lay. June 17, 1965. <https://cdn.toxicdocs.org/Jv/JvvdQeB5gvdOxdm dqX8wg3KZB/JvvdQeB5gvdOxdmdqX8wg3KZB.pdf>. Accessed 10 Sept 2018.
67. Kelly RE to Marcus Key, US PHS. March 15, 1962. <https://cdn.toxicdocs.org/2q/2qv9K3rJVO kq6p8M199V91M5/2qv9K3rJVOkq6p8M199V91M5.pdf>. Accessed 10 Sept 2018.
68. Wheeler EP to Nemitz FT. Re: Aroclor 1232 federal hazardous substances labeling act. May 27, 1964. <https://cdn.toxicdocs.org/DG/DGBRV6dBOVdrYZ6nDjOzaoR95/DGBRV6dBOVdrYZ6 nDjOzaoR95.pdf>. Accessed 10 Sept 2018.
69. Wheeler E to Davis R. Aroclor 1242-Reliance Electric and Engineering Company, Cleveland. Sept 3, 1965. <https://cdn.toxicdocs.org/Xz/Xz5JaqrLo3kwmq8z8oqk7M74w/Xz5JaqrLo3kwmq8z8oqk 7M74w.pdf>. Accessed 10 Sept 2018.
70. Kelly RE to Singer IM. Du Pont. July 1, 1965. <https://cdn.toxicdocs.org/re/rexwyJ2RRkM3b0R RxKZxEnV8E/rexwyJ2RRkM3b0R RxKZxEnV8E.pdf>. Accessed 10 Sept 2018.
71. Jensen S, Widmark G. University of Stockholm, “Presence of Polychlorinated Biphenyls at Residue of Biological Samples”. Sept 1, 1966. <https://cdn.toxicdocs.org/n9/n9GpoKmeX3w4GkV Y6vp7z3OJm/n9GpoKmeX3w4GkVY6vp7z3OJm.pdf>. Accessed 10 Sept 2018.
72. Palm O to Wood D. Monsanto Europe. Nov 28, 1966. <https://cdn.toxicdocs.org/aB/aBXzXwOEv3 oKgjVQZzm0EZXB/aBXzXwOEv3oKgjVQZzm0EZXB.pdf>. Accessed 10 Sept 2018.
73. Wood D to Buchanan G. Monsanto St. Louis. Dec 1, 1966. <https://cdn.toxicdocs.org/rx/rxqzve8zae 7V081vXNn0R7mnJ/rxqzve8zae7V081vXNn0R7mnJ.pdf>. Accessed 10 Sept 2018.
74. Ferguson DE. Professor Zoology at Mississippi State University, to L.C. Fuhrmeister. Oct 5, 1966. Available at: <https://cdn.toxicdocs.org/k6/k6dx8oN5V6D2YGBqXprxL5Yo0/k6dx8oN5V6D2YGB qXprxL5Yo0.pdf>. Accessed 10 Sept 2018.
75. Ferguson DE to Fuhrmeister LC. Technical Services Supt, Monsanto, Anniston. Nov 2, 1966. <https://cdn.toxicdocs.org/3m/3maM85Qok7e6kM7ywwKaJgk6/3maM85Qok7e6kM7ywwKaJgk6.pdf>. Accessed 19 Oct 2018.
76. Hardy DVN. Monsanto London to Monsanto officials in St. Louis, NY, Brussels and London. Jan 12, 1967. <https://cdn.toxicdocs.org/7R/7RDNr66Gmo4moLE8obg8J7YMB/7RDNr66Gmo4moLE 8obg8J7YMB.pdf>. Accessed 10 Sept 2018.
77. Wood D. Brussels, Monsanto to G.R. Buchanan, St. Louis, Monsanto. Jan 26, 1967. <https://cdn.toxicdocs.org/15/15J9QN1eZ1GGrMz3n7kowOom/15J9QN1eZ1GGrMz3n7kowOom.pdf>. Accessed 10 Sept 2018.
78. Hardy DVN. Research services manager, Monsanto Chemicals Limited to Borden Chemicals Ltd. Feb 2, 1967. <https://cdn.toxicdocs.org/pm/pmk8EyLpQXEjwr8yKJmm5OBY7/pmk8EyLpQX Ejwr8yKJmm5OBY7.pdf>. Accessed 10 Sept 2018.
79. Kelly RE to Wood D. Feb 10, 1967. <https://cdn.toxicdocs.org/Dv/DvwQmw6nwO6bL6xXxxYB Zmq8N/DvwQmw6nwO6bL6xXxxYBZmq8N.pdf>. Accessed 10 Sept 2018.
80. Wilde G to Kelly RE. Evil publicity on chlorinated biphenyls. Feb 13, 1967. <https://cdn.toxicdocs.org/Z8/Z82Yr704gwZM6jG95wM1oDrLJ/Z82Yr704gwZM6jG95wM1oDrLJ.pdf>. Accessed 10 Sept 2018.
81. Wilde G to Kelly RE. Evil publicity on chlorinated biphenyls. Feb 13, 1967. Available at: <https://cdn.toxicdocs.org/Z8/Z82Yr704gwZM6jG95wM1oDrLJ/Z82Yr704gwZM6jG95wM1oDrLJ.pdf>. Accessed 10 Sept 2018.
82. Kelly RE to Anagnostopoulos LE. May 6, 1968. <https://cdn.toxicdocs.org/nk/nkY61Og1mLw wXqGZBLJ36Dz31/nkY61Og1mLwwXqGZBLJ36Dz31.pdf>. Accessed 10 Sept 2018.
83. Kelly RE to Thomas NCR. Research division. Feb 27, 1967. <https://cdn.toxicdocs.org/em/em4oJ M1XX9y2OMo3OxR2Bj9Ye/em4oJM1XX9y2OMo3OxR2Bj9Ye.pdf>. Accessed 10 Sept 2018.
84. Kelly RE to Wood D. Feb 27, 1967. <https://cdn.toxicdocs.org/9J/9JG8217oVEY6Zqalj2EvxVgx5 /9JG8217oVEY6Zqalj2EvxVgx5.pdf>. Accessed 10 Sept 2018.
85. Kelly RE to Wilde G. Feb 21, 1967. <https://cdn.toxicdocs.org/wq/wqy7Y53x87Ex7OLMRNYj x9qq3/wqy7Y53x87Ex7OLMRNYjx9qq3.pdf>. Accessed 10 Sept 2018.
86. Hardy DVN to Henderson A. Shell chemicals, England. Nov 3, 1967. <https://cdn.toxicdocs.org/Lg/ Lgr1vg560N7ovYE7aeydd7Qm5/Lgr1vg560N7ovYE7aeydd7Qm5.pdf>. Accessed 10 Sept 2018.
87. [Monsanto] Board of Directors Meeting. Nov 22, 1967. <https://cdn.toxicdocs.org/pe/peN1XxVawV bjgQaqOOR10Zdya/peN1XxVawVbjgQaqOOR10Zdya.pdf>. Accessed 10 Sept 2018.
88. Monsanto pamphlet. Aroclor Department 246. Sept 9, 1967. <https://cdn.toxicdocs.org/zQ/zQmwM wBmnarnnEDVn7ZEZeZv7/zQmwMwBmnarnnEDVn7ZEZeZv7.pdf>. Accessed 10 Sept 2018.
89. “The Word on Aroclor”. Issue No. 1, 1st Quarter 1968 [Ca. April 1968]. <https://cdn.toxicdocs.org/zo/zo2GJnzNEOe23bzZ7J315GBzn/zo2GJnzNEOe23bzZ7J315GBzn.pdf>. Accessed 10 Sept 2018.



90. Monsanto. "Outline PCB Environmental Pollution Abatement Plan", Nov 10, 1968. <https://cdn.toxicdocs.org/wD/wDV5agbV16rQYMZzEw265kL76/wDV5agbV16rQYMZzEw265kL76.pdf>. Accessed 10 Sept 2018.
91. Ingersoll B. DDT on trial in Wisconsin-part II. Bioscience. 19(Aug 1969), 735-736.
92. Richard WR. Research Center to W. A. Kuhn "Aroclor-Wildlife. Dec 30, 1968. <https://cdn.toxicdocs.org/wg/wgr1q5kryvMEODMvRl845ZM8Q/wgr1q5kryvMEODMvRl845ZM8Q.pdf>. Accessed 10 Sept 2018.
93. Roush D. Monsanto to JJ Roder, Chicago. Feb 14, 1969. <https://cdn.toxicdocs.org/MM/MMqLkVbpJEaQjNBr79vXdzqgz/MMqLkVbpJEaQjNBr79vXdzqgz.pdf>. Accessed 10 Sept 2018.
94. Hammond AL. Chemical pollution: polychlorinated biphenyls. Science. 175(Jan 14, 1972), 156.
95. Tucker ES. Research and Development Laboratories, Monsanto, to W. R. Richard, "Aroclor-Wildlife: Incineration of N.C.R. Paper". March 4, 1969. <https://cdn.toxicdocs.org/N2/N2NwrKxyeDRzyQmME00JwXxn8/N2NwrKxyeDRzyQmME00JwXxn8.pdf>. Accessed 10 Sept 2018.
96. Wheeler E to Richard WR. Polychlorinated biphenyls in the environment. Oct 21, 1968. <https://cdn.toxicdocs.org/r6/r60vq1G4DYd6LorQzJ7xo75Ba/r60vq1G4DYd6LorQzJ7xo75Ba.pdf>. Accessed 10 Sept 2018.
97. Richard WR to Wheeler E. Aroclor wildlife accusations. March 6, 1969. <https://cdn.toxicdocs.org/70/70DJRKByONVpEXLYQpppVw8MV/70DJRKByONVpEXLYQpppVw8MV.pdf>. Accessed 10 Sept 2018.
98. Final Draft. Statement from Monsanto Company. March 3, 1969. <https://cdn.toxicdocs.org/MG/MGkrMaxGjzGv68ZK9ZkLxd1aa/MGkrMaxGjzGv68ZK9ZkLxd1aa.pdf>. Accessed 10 Sept 2018.
99. Richard WR to File. Notes on meeting 3/6/69 Industrial Bio-Test Laboratories, Inc Aroclor-Wildlife. March 10, 1969. <https://cdn.toxicdocs.org/Zd/Zdj2B78O7pRvEXMBKxEwmrZL/Zdj2B78O7pRvEXMBKxEwmrZL.pdf>. Accessed 10 Sept 2018.
100. Metcalf RL. Report and comments on meeting on chlorinated biphenyls in the Environment at Industrial Biotest Laboratories, Chicago. March 21, 1969. April 2, 1969. <https://cdn.toxicdocs.org/2J/2JqOqNKQJDM8xMogejnbDepeg/2JqOqNKQJDM8xMogejnbDepeg.pdf>. Accessed 10 Sept 2018.
101. Richard WR. Research Center, to P. Benignus, "Disposal and Incineration of Aroclor". April 14, 1969. <https://cdn.toxicdocs.org/3e/3ezJ6MYzGZGxbB83LpzK4pzx3/3ezJ6MYzGZGxbB83LpzK4pzx3.pdf>. Accessed 10 Sept 2018.
102. Monsanto. Minutes of meeting of the corporate development committee. April 28, 1969. <https://cdn.toxicdocs.org/pe/peLEkjB3jvXmma3mdZ1J4e4Na/peLEkjB3jvXmma3mdZ1J4e4Na.pdf>. Accessed 10 Sept 2018.
103. Hodges PB to Kuhn WA. Aroclors clean-up from plant effluents. May 12, 1969. <https://cdn.toxicdocs.org/15/15XzzwZndbE1pVwOVwkp1eJZd/15XzzwZndbE1pVwOVwkp1eJZd.pdf>. Accessed 10 Sept 2018.
104. Elmer Wheeler to W.R. Richard, May 26, 1969. Available at: <https://cdn.toxicdocs.org/Rj/Rj5jaZjo6ExgBqV0rN2K264va/Rj5jaZjo6ExgBqV0rN2K264va.pdf>. Accessed 10 Sept 2018.
105. Tucker ES. Monthly summary-Aroclor Wildlife. Anal Stud. June 24, 1969. <https://cdn.toxicdocs.org/5D/5D2Z4G2xkN5nK8jV8Rjow58pe/5D2Z4G2xkN5nK8jV8Rjow58pe.pdf>.
106. Handwritten Notes, Monsanto. PCB committee. Aug 25, 1969. <https://cdn.toxicdocs.org/X7/X7JKvq01ExZb77QZ857rM8y7d/X7JKvq01ExZb77QZ857rM8y7d.pdf>. Accessed 10 Sept 2018.
107. Wheeler EP. Monsanto. Minutes of Aroclor Ad Hoc committee, first meeting. Sept 5, 1969. <https://cdn.toxicdocs.org/j6/j6G5oJ35mrwLQDX08NwX58e5/j6G5oJ35mrwLQDX08NwX58e5.pdf>. Accessed 10 Sept 2018.
108. Richard WR to Wheeler E. Defense of Aroclor-F. fluids. Sept 9, 1969. <https://cdn.toxicdocs.org/G9/G9N4ELOXXMxZE0Bm05ZrOx24/G9N4ELOXXMxZE0Bm05ZrOx24.pdf>. Accessed 10 Sept 2018.
109. Wheeler EP to Bergen HS. Jr. and Springate JE. Monsanto, "report of Aroclor Ad Hoc committee. Oct 2, 1969. <https://cdn.toxicdocs.org/aJ/aJm5R2kKwQ8QygwNr5aG2v8XN/aJm5R2kKwQ8QygwNr5aG2v8XN.pdf>. Accessed 10 Sept 2018.
110. Wheeler EP to Harris R. Jr. Report of Aroclor Ad Hoc committee (Second Draft). Director, Law Department. Oct 15, 1969. <https://cdn.toxicdocs.org/jm/jmE5a5X6OzKOedmG0pmDko7gp/jmE5a5X6OzKOedmG0pmDko7gp.pdf>. Accessed 10 Sept 2018.
111. Monsanto. Executive summary, PCB pollution. Oct 29, 1969. <https://cdn.toxicdocs.org/dQ/dQV9je46E955K3V2qqmLL00VB/dQV9je46E955K3V2qqmLL00VB.pdf>. Accessed 10 Sept 2018.



112. Munch RH. St. Louis Organic Research to W.R. Richard, “Future posture-dielectrics”. Dec 5, 1969. <https://cdn.toxicdocs.org/a4/a4VOBNroOoZMG6rYzVxxVpbv9/a4VOBNroOoZMG6rYzVxxVpbv9.pdf>. Accessed 10 Sept 2018.
113. Benignus. Jan. 21-22, 1970, The PCB-pollution problem: St. Louis Meeting with General Electric. Jan 26, 1970. <https://cdn.toxicdocs.org/Ed/EdoyOJrmzBNJpQnGg36Oj3Y2j/EdoyOJrmzBNJpQnGg36Oj3Y2j.pdf>. Accessed 10 Sept 2018.
114. Wheeler E. Medical department, to D.S. Cameron, Brussels “Status of Aroclor Toxicological Studies”. Jan 29, 1970. <https://cdn.toxicdocs.org/2j/2jL8M95xdp5RY8KpddQ1R64wp/2jL8M95xdp5RY8KpddQ1R64wp.pdf>. Accessed 10 Sept 2018.
115. Johnson NT. St. Louis, to number of people “Pollution Letter”. Feb 16, 1970. <https://cdn.toxicdocs.org/71/71G3veKoobQbDwNV44ROELbZg/71G3veKoobQbDwNV44ROELbZg.pdf>. Accessed 10 Sept 2018.
116. Olson DA. Director of sales, functional fluids groups “Dear Sir”. Feb 18, 1970. <https://cdn.toxicdocs.org/O1/O1VwQ9o4VZGDdopBa17EabzkL/O1VwQ9o4VZGDdopBa17EabzkL.pdf>. Accessed 10 Sept 2018.
117. Wheeler E. Manager, Environmental health to Dr. Joseph C. Calandra, IBT on upcoming meeting March 4, 1970. <https://cdn.toxicdocs.org/pB/pBk162eLMLdXJ3K7yMEG9L8Xk/pBk162eLMLdXJ3K7yMEG9L8Xk.pdf>. Accessed 10 Sept 2018.
118. Papageorge WB. St. Louis to J.R. Durland, Tokyo “Aroclor Environmental Program”. March 6, 1970. <https://cdn.toxicdocs.org/3e/3eV1qnedEeMD9LZxwgq6RbG8D/3eV1qnedEeMD9LZxwgq6RbG8D.pdf>. Accessed 10 Sept 2018.
119. Industrial Wastes: Nondegradable Additive. *Science News*, 97(March 28, 1970), 321.
120. Kelly RE to Papageorge WB. March 30, 1970. <https://cdn.toxicdocs.org/qk/qkND3varrKwwQVwQqbm5Okq3x/qkND3varrKwwQVwQqbm5Okq3x.pdf>. Accessed 10 Sept 2018.
121. Call for PCB’s. *Science*, 168(May 1, 1970): 557.
122. Bird D. Curb Urged in Use of PCB Chemical. *New York Times*. April 11, 1970, p. 30.
123. Monsanto Press Release. Monsanto replies to charge that PCB threatens environment. April 10, 1970. <https://cdn.toxicdocs.org/n0/n067kxNXvb99wEYwgOgQD8Gw/n067kxNXvb99wEYwgOgQD8Gw.pdf>. Accessed 10 Sept 2018.
124. Keller RE to Papageorge WB. Environmental materials analyzed by Monsanto for PCBs. “Personal and Confidential”. Apr 17, 1970. <https://cdn.toxicdocs.org/Rj/RjgD4Nok1qaNnz8pEB3xzJjMv/RjgD4Nok1qaNnz8pEB3xzJjMv.pdf>. Accessed 10 Sept 2018.
125. Monsanto. PCB presentation to the corporate development committee. April, 1970. <https://cdn.toxicdocs.org/K6/K6ZYN6ormbxMavj944QxJVjjX/K6ZYN6ormbxMavj944QxJVjjX.pdf>. Accessed 10 Sept 2018.
126. Monsanto. Report by organic division, “Minutes of Corporate Management Committee.” April 20, 1970. <https://cdn.toxicdocs.org/v6/v6j0b6aQnReQJbOREOvze7y6Z/v6j0b6aQnReQJbOREOvze7y6Z.pdf>. Accessed 10 Sept 2018.
127. Monsanto. Performance review: 1970 objectives-polychlorinated biphenyl environmental problem. [ca. mid-1970]. <https://cdn.toxicdocs.org/9J/9Jo8Ga9bZLD4br6XBrjqvMBXD/9Jo8Ga9bZLD4br6XBrjqvMBXD.pdf>. Accessed 10 Sept 2018.
128. Rosenbaum D. Monsanto Plans to Curb Chemical. *New York Times* July 15, 1970, p. 27.
129. First DDT, Now PCB. *Science News*, 98(Oct 24, 1970), 332.
130. Keller RE. St Louis Organic Research to Papageorge. April 17, 1970. <https://cdn.toxicdocs.org/Rj/RjgD4Nok1qaNnz8pEB3xzJjMv/RjgD4Nok1qaNnz8pEB3xzJjMv.pdf>. Accessed 10 Sept 2018.
131. Hunt WH to Kelly RE and Wheeler E. April 29, 1970. <https://cdn.toxicdocs.org/zo/zoVoeBQ8Zz28Qm3jbgYGL6ZXz/zoVoeBQ8Zz28Qm3jbgYGL6ZXz.pdf>. Accessed 10 Sept 2018.
132. Papageorge WB. Manager, Environmental Control to D.E. Cavanaugh, Espey Manufacturing Co., Saratoga Springs, NY. July 6, 1970. <https://cdn.toxicdocs.org/zQ/zQyeOyQ32jpNkDb9jB2GoX4Dm/zQyeOyQ32jpNkDb9jB2GoX4Dm.pdf>. Accessed 10 Sept 2018.
133. McKee JE. Jr. Assistant Director of Public Relations, to the *Miami Herald*. Letter to the Editor. July 14, 1970. <https://cdn.toxicdocs.org/yb/yb75rpV0xLDpXBw0Qd3bnmJxn/yb75rpV0xLDpXBw0Qd3bnmJxn.pdf>. Accessed 10 Sept 2018.
134. Papageorge WB. PCB environmental problem july status report. Aug 18, 1970. <https://cdn.toxicdocs.org/VK/VKj39R9XJd6geModReJBMwoRw/VKj39R9XJd6geModReJBMwoRw.pdf>. Accessed 10 Sept 2018.
135. PCB’s: Monsanto Reduces Sales. *Science News*, 98(July 25, 1970), 69.



136. Papageorge WB. PCB environmental problem August status report. Sept 8, 1970. <https://cdn.toxicdocs.org/ZB/ZBrOvyzgGk5vakmObmNyzj6VO/ZBrOvyzgGk5vakmObmNyzj6VO.pdf>. Accessed 10 Sept 2018.
137. Technical Service Department, Progress Report, Anniston Alabama Plant, "Aroclor Losses at the Anniston Plant". July 21, 1970. <https://cdn.toxicdocs.org/50/50aGY46yM7pO5Ra0Gj8NNQ82J/50aGY46yM7pO5Ra0Gj8NNQ82J.pdf>. Accessed 10 Sept 2018.
138. Hodges P. St. Louis, General Offices to H.S. Bergen, Jr., "Anniston-PCB-Cleanup Program Confidential-F.Y.I. and Destroy". Aug 7, 1970. <https://cdn.toxicdocs.org/4v/4vMxmYzO4gw3oYRQJoE5n8qLV.pdf>. Accessed 10 Sept 2018.
139. Hodges PB to Bell T. Anniston "Confidential". Sept 18, 1970. <https://cdn.toxicdocs.org/JJ/JJ93QD6VwQK7pd5B5O8EmgkQX/JJ93QD6VwQK7pd5B5O8EmgkQX.pdf>. Accessed 10 Sept 2018.
140. PCB Effects on Mammals. by M. Berlin, Institute of Hygiene, University of Lund, Sweden, PCB Conference, Stockholm. Sept 29, 1970. <https://cdn.toxicdocs.org/zo/zooDK16qnY8r7pbGGQv5y0gR/zo/zooDK16qnY8r7pbGGQv5y0gR.pdf>.
141. Papageorge WB to Villand FR. Senior buyer transformer division westinghouse corporation. Oct 1, 1970. <https://cdn.toxicdocs.org/OE/OEBn7am8ynNOEbwVLDdJ3pr2e/OEBn7am8ynNOEbwVLDdJ3pr2e.pdf>. Accessed 10 Sept 2018.
142. Papageorge WB. St. Louis, "PCB Environmental Problem September Status Report," Oct 6, 1970. Available at: <https://cdn.toxicdocs.org/b1/b1gV7ZZ6Z4OzyVND5VEJLRNg/b1gV7ZZ6Z4OzyVND5VEJLRNg.pdf> Accessed 10 Sept 2018.
143. Papageorge W. Internal Memo, "PCB Environmental Problem, July Status Report". Aug 18, 1970. <https://cdn.toxicdocs.org/VK/VKj39R9XJd6geModReJBMwoRw/VKj39R9XJd6geModReJBMwoRw.pdf>. Accessed 10 Sept 2018.
144. Graham R. Senior Fluids Specialist "Dear ____". Oct 12, 1970. <https://cdn.toxicdocs.org/DD/DDndyqr0RoeB7MgE6MVYjyO/DDndyqr0RoeB7MgE6MVYjyO.pdf>. Accessed 10 Sept 2018.
145. Auzine MJ. Project manager, to the secretary, ministry of industrial development and internal trade. "Draft - 10/15/70". https://urldefense.proofpoint.com/v2/url?u=https-3A__cdn.toxicdocs.org_b5_b5BweXqR31j1jaX7O8g5MxJVo_b5BweXqR31j1jaX7O8g5MxJVo.pdf&d=DwMFAg&c=G2MiLl17SXE3PeSnG8W6_JBU6FcdVjSsBSbw6gcR0U&r=RiKflvrObbh5s4T1hP_jScFxo4COYkmf6exFNfYRho&m=w-G9CyIIXF59rKkArj5C_zdtUG07rAD4MQLzfZ93trA&s=b32ulJZJeM9CnOjqF1orC63JKVLOHKK3jTLG_KWL-eM&e. Accessed 11 July 2018.
146. John EV. World headquarters to Papageorge, WPAPA "November PR Report". Nov 30, 1970. <https://cdn.toxicdocs.org/xj/xj0oOZK0ZerrxJyeEpmZ1Gwnm/xj0oOZK0ZerrxJyeEpmZ1Gwnm.pdf>. Accessed 10 Sept 2018.
147. Papageorge WB to Savage JR. Dec 7, 1970. <https://cdn.toxicdocs.org/NE/NEgK6NokkpaoajR9Y8ObqLOJb/NEgK6NokkpaoajR9Y8ObqLOJb.pdf>. Accessed 10 Sept 2018.
148. William M to Severson BO. Jan 20, 1971.
149. Papageorge WB to Savage J. PCB in Plant Effluent. Jan 29, 1971. <https://cdn.toxicdocs.org/ym/ymJLLXwMG4415RZO5VyOjmp3X/ymJLLXwMG4415RZO5VyOjmp3X.pdf>. Accessed 19 Oct 2018.
150. Blumenthal H. Acting deputy director, division of toxicology, to Leo Friedman, Director, Division of Toxicology, "Memorandum for the Record: Updated Review of Toxicity Studies in Progress with Polychlorinated Biphenyls (Aroclor 1242, 1245 and 1260)". July 30, 1971. <https://cdn.toxicdocs.org/by/by3bJ1o2dLjw1QmJG7mxM4mK1/by3bJ1o2dLjw1QmJG7mxM4mK1.pdf>. Accessed 10 Sept 2018.
151. Wheeler EP to Otto D. PCB Literature Search. Aug 6, 1971. <https://cdn.toxicdocs.org/pB/pB60N8mMjyO72oZdo5nL4EaZX/pB60N8mMjyO72oZdo5nL4EaZX.pdf>. Accessed 10 Sept 2018.
152. Burchard H. Chemical Found in Chickens. *Washington Post*, July 24, 1971. p.B-1.
153. Farm Unit, Producers Hunt for Chickens Tied to Contaminated Feed. *Wall Street Journal*, July 26, 1971, p.15.
154. Burchard H. Millions of Chickens Tainted. *Washington Post*, July 29, 1971, p. A-1.
155. Burchard H. Chickens Fed Tainted Meal Termed Safe. *Washington Post*, July 30, 1971, p. D-1.
156. Blair WM. Senate Unit Told of Fish Tainting. *New York Times*, Aug 5, 1971, p. 22.
157. Blair WM. Poultry Found Safe for Eating Despite Contamination of Feed. *NY Times*, July 30, 1971, p. 15.
158. Early J to Papageorge WB. Feb 2, 1971. https://urldefense.proofpoint.com/v2/url?u=https-3A__cdn.toxicdocs.org_mp_mpx8bNqz5nR8qEoq9YKm78n3B_mpx8bNqz5nR8qEoq9YKm78n3B



- .pdf&d=DwMFAg&c=G2MiLl7SXE3PeSnG8W6_JBU6FcdVjSsBSbw6gcR0U&r=RiKfIvrvObbh5s4T1hP_jScFxO4COYkmf6exFNfYRho&m=BuGhldDlnueN6W2Zwq2Qhv5q8TbQP_bg9oqL91dqrA&s=0y5li-seHHmf9tLIYZNd8sj4U1m5oqhON4-SfkOz4_g&e=. Accessed 12 Sept 2018.
159. Pichirallo J. PCB's: leaks of toxic substances raise issues of effects, regulation. *Science*. 173(Sept 3, 1971), 900–901.
 160. Burchard H. Law Sought to Ban DDT-Like Chemical. *Washington Post*, July 25, 1971, p. 50.
 161. Suttus RD. Gunning GE. Independent biological consultants to Eugene Wright, pollution control engineer, Monsanto. Aug 15, 1971. <https://cdn.toxicdocs.org/by/byrdRJe2meej4G7Rd4Dnypdyo/byrdRJe2meej4G7Rd4Dnypdyo.pdf>. Accessed 10 Sept 2018.
 162. Bergen HS. Memo, “Aroclor 1221”. Sept 3, 1971. <https://cdn.toxicdocs.org/nB/nBbQamyorEQOzk66v4xbD5x8/nBbQamyorEQOzk66v4xbD5x8.pdf>. Accessed 10 Sept 2018.
 163. Lyons RD. Panel Organized to Study DDT-Like Compound for Environmental Hazards. *New York Times*, Sept 23, 1971, p. 32.
 164. Bassett J. A New Chicken and Egg Riddle: PCB Pollution. *Los Angeles Times*, Sept 19, 1971, p. 16A.
 165. Monsanto Limits Food Plants' Use of Chemical PCB. *Washington Post*, Sept 30, 1971, p. 18.
 166. Levinskas GJ. Medical Department, to file. “Aroclor 1260”. Oct 13, 1971. <https://cdn.toxicdocs.org/94/94Qp81dz9DGqVLYNOBdavnqV/94Qp81dz9DGqVLYNOBdavnqV.pdf>. Accessed 10 Sept 2018.
 167. Dahlgren RB, Greichus YA, Linder RL. Storage and excretion of polychlorinated biphenyls in the pheasant. *J Wildl Manag.* 35(Oct 1971), 823–828.
 168. Papageorge WB to Risebrough R. Nov 4, 1971. <https://cdn.toxicdocs.org/NE/NEMx8dgr5dDLbKGjLgbNEBZXV/NEMx8dgr5dDLbKGjLgbNEBZXV.pdf>. Accessed 10 Sept 2018.
 169. Begnius PG to Potter EM. Aroclor drums. Dec 17, 1971. <https://cdn.toxicdocs.org/R0/R0y0MrRegm10rkxgyNJmeJ2k/R0y0MrRegm10rkxgyNJmeJ2k.pdf>. Accessed 10 Sept 2018.
 170. Hammond AL. Chemical pollution: polychlorinated biphenyls. *Science*. 175(Jan 14, 1972), 156.
 171. Editorial. Perspective on PCBs. *Environ. Health Perspect.* 1972;1(April, 1972):1.
 172. Price HA, Welch RL. Occurrence of polychlorinated biphenyls in humans. *Environ Health Perspect.* 1(Apr 1972), 73–78.
 173. Peakall DB, Lincer JL, Bloom SE. Embryonic mortality and chromosomal alterations caused by Aroclor 1254 in ringdoves. *Environ Health Perspect.* 1(Apr 1972), 103–104.
 174. Vos JG. Toxicology of PCBs for mammals and for birds. *Environ Health Perspect.* 1(Apr 1972), 105–117.
 175. Stalling DL, Mayer FE Jr. Toxicities of PCBs to fish and environmental residues. *Environ Health Perspect.* 1(Apr 1972), 159–164.
 176. Kolbye AC Jr. Food exposures to polychlorinated biphenyls. *Environ Health Perspect.* 1(Apr 1972), 85–88.
 177. Fries GF. Polychlorinated biphenyls residues in milk of environmentally and experimentally contaminated cows. *Environ Health Perspect.* 1(Apr 1972), 55–59.
 178. Bitman J, Cecil HC, Harris SJ. Biological effects of polychlorinated biphenyls in rats and quail. *Environ Health Perspect.* 1(Apr 1972), 145–149.
 179. Hammer DI, et al. Polychlorinated biphenyl residues in the plasma and hair of refuse workers. *Environ Health Perspect.* 1(Apr 1972), 83.
 180. Greene E to Berndt JP, et al. Jan 14, 1972 <https://cdn.toxicdocs.org/xz/xz9yM9ba8zwwQ8VeK1nn0MKDQ/xz9yM9ba8zwwQ8VeK1nn0MKDQ.pdf>. Accessed 10 Sept 2018.
 181. General Electric Company and Monsanto Company. Special undertaking by purchasers of polychlorinated biphenyls. Jan 21, 1972. <https://cdn.toxicdocs.org/jB/jBewELOz9YVb0gvvpvGbmJGB90/jBewELOz9YVb0gvvpvGbmJGB90.pdf>. Accessed 10 Sept 2018.
 182. Mead WB. EPA Vows to Curb Discharge of PCB. *Washington Post*. May 14, 1972, p.A-21.
 183. Interdepartmental Task Force on PCBs. Polychlorinated biphenyls and the environment. May, 1972. <https://cdn.toxicdocs.org/X7/X7R2kX908p1xLR1k1KNVaYD4w/X7R2kX908p1xLR1k1KNVaYD4w.pdf>. Accessed 10 Sept 2018.
 184. Rensberger B. Foods Still carry a Toxic Chemical. *NY Times*. Sept 5, 1972, p.15.
 185. Willard H. River Reveals High PCB Dose. *Washington Post*. Sept 7, 1972, p. F-1.
 186. PCB is Discovered in 17 of 39 States. *Washington Post*, Sept 20, 1972, B-3.
 187. FDA Curbs Chemicals in Feeds. *Washington Post*, July 7, 1973, p. A-3



188. Severo R.: State Says Some Striped Bass and Salmon Pose a Toxic Peril. *NY Times*. Aug 8, 1975, p. 57.
189. Severo R. Reports of Chemical in Fish Initially Withheld. *NY Times*. Aug 17, 1975, p. 44.
190. Suttikus RD. Gunning G. Independent biological consultants to Mr. JT Bell, Plant Chief Chemist, Monsanto Company. June 9, 1972. <https://cdn.toxicdocs.org/yp/ypBJKae7G1M5Vzx6O4gbVK5zn/ypBJKae7G1M5Vzx6O4gbVK5zn.pdf>. Accessed 10 Sept 2018.
191. Jesse GL. Plant manager, Monsanto to John C. White, director, EPA. July 5, 1972.
192. Gunning GE. An independent biological consultant to JT Bell, Monsanto plant chief chemist. "Final Progress Report to Monsanto Company, Residue Data, November 1970–November 1972". Feb 27, 1973. <https://cdn.toxicdocs.org/5L/5L0K5mZ5RYOyav2N28RR7wrN/5L0K5mZ5RYOyav2N28RR7wrN.pdf>. Accessed 10 Sept 2018.
193. Bryant JG to Wood D. Minutes of 'safe handling of PCB fluids and materials for disposal of waste fluids' and 'industrial benefits of polychlorinated biphenyl dielectric fluids'. Sept 27, 1974. <https://cdn.toxicdocs.org/7O/7Oy5RXaDXZb018k1o5NqK655B/7Oy5RXaDXZb018k1o5NqK655B.pdf>. Accessed 10 Sept 2018.
194. Gunning GE to Monsanto Industrial Chemicals Company, Att: Edward E. Stewart. Oct 4, 1974. <https://cdn.toxicdocs.org/n9/n9YyMwXYRzxmzkzMBKMGQO28Kw/n9YyMwXYRzxmzkzMBKMGQO28Kw.pdf>. Accessed 10 Sept 2018.
195. Wagoner J. Director, division of field studies and clinical investigations, NIOSH, to Emmet Kelly, MD, Monsanto Chemical Corporate. Oct 15, 1974. <https://cdn.toxicdocs.org/MG/MGevg3bVbz6kryyzzgaM5N8nL/MGevg3bVbz6kryyzzgaM5N8nL.pdf>. Accessed 10 Sept 2018.
196. Papageorge WB. Manager, product acceptability specialty and process chemicals, Monsanto to Dan A. Albert, staff supervisor, personnel relations, Westinghouse Electric Corporation. March 18, 1975. <https://cdn.toxicdocs.org/vV/vVdo1v3dp2jyxgRLzX36djv2R/vVdo1v3dp2jyxgRLzX36djv2R.pdf>. Accessed 10 Sept 2018.
197. Calandra JC. President, industrial bio-test to George Levinskas, Monsanto, Re: IBT No. 641-06672 evaluation of liver sections 1260, "Report to Monsanto Company Two Year Chronic Oral Toxicity Study with Aroclor 1260 in Albino Rats, Histopathological Evalaution of Additional Liver Sections". March 24, 1975[1]. <https://cdn.toxicdocs.org/99/996yXwe061E4oYrgzYe9G7Mj6/996yXwe061E4oYrgzYe9G7Mj6.pdf>. Accessed 10 Sept 2018.
198. Calandra JC. President, industrial bio-test to George Levinskas, Monsanto, Re: IBT No. 641-06672 evaluation of liver sections 1260, "Report to Monsanto Company Two Year Chronic Oral Toxicity Study with Aroclor 1260 in Albino Rats". March 24, 1975[2]. <https://cdn.toxicdocs.org/99/996yXwe061E4oYrgzYe9G7Mj6/996yXwe061E4oYrgzYe9G7Mj6.pdf>. Accessed 10 Sept 2018.
199. Calandra JC to Roush G. Review of Meeting. April 18, 1975. <https://cdn.toxicdocs.org/by/byRK2EN3dLdGxoD31mJGp4996/byRK2EN3dLdGxoD31mJGp4996.pdf>. Accessed 10 Sept 2018.
200. Lucille C. Henschel, Acting Project Manager, Vinyl Chloride Research, MCA, to Vinyl Chloride Audit Task Group, Jan 11, 1979, cited in Gerald Markowitz and David Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution*, (University of California Press/Milbank, 2002), p. 215.
201. West B. Associates, Inc., Confidential and privileged review and audit of IBT". May 10, 1980, cited in Markowitz and Rosner, *Deceit and Denial*, p. 215.
202. Tighter Controls on Toxics Testing. *Chemical Week*, 145 (Aug 24, 1983): 32–39.
203. Levinskas GJ. PhD manager, environmental assessment and toxicology, Monsanto, to Dr. J. C. Calandra, BIOTEST. Re: AROCLOR 2-year Rat Feeding Studies". July 18, 1975. <https://cdn.toxicdocs.org/K6/K67gZNYO4dK3R2jo2q6YDxBMN/K67gZNYO4dK3R2jo2q6YDxBMN.pdf>. Accessed 10 Sept 2018.
204. Calandra JC to Levinskas G. Aug 4, 1975. <https://cdn.toxicdocs.org/nz/nzz2RE67Zbg1a3nQ2q7M0Yw1/nzz2RE67Zbg1a3nQ2q7M0Yw1.pdf>. Accessed 10 Sept 2018.
205. Wright PL. Department of Medicine and Environmental Health, Monsanto, to George Roush, Jr. "Toxicity Studies with PCB in Primates," March 24, 1976. <https://cdn.toxicdocs.org/mw/mwbvmeyY2rgnxyBLYxdEzn0Bb/mwbvmeyY2rgnxyBLYxdEzn0Bb.pdf>. Accessed 19 Oct 2018.
206. Tannenbaum JA.. Persistent PCBs; Industrial Pollutants May be Worse Threat than DDT to Ecology. *Wall Street Journal*, Oct 10, 1975, p. 1.
207. Mintz M. Toxic Agents Polluting Environment. *Washington Post*, Oct 25, 1975, p. A-2.
208. Levinskas G. Aroclor 1260: meeting at NCI, Jan 31, 1975. 1975. <https://cdn.toxicdocs.org/Vb/VbnXbEV6Qq1ykxy3doBn32v4/VbnXbEV6Qq1ykxy3doBn32v4.pdf>. Accessed 10 Sept 2018.
209. Ward F. Health Hazard from PCBs Seen Rising. *Los Angeles Times*, Dec 12, 1975, p. K1.
210. Severo R. EPA Aide Warns of Toxic Leakage. *New York Times*, Nov 20, 1975, p. 20.



211. Severo R. Chemical Threat Held Widespread. *New York Times*, Nov 21, 1975, p. 24.
212. Severo R. Interior Aide Urges Curbs on Use of PCB Chemical. *New York Times*, Nov 22, 1975, p. 60.
213. Bishop DR to 14 Monsanto Officials, [including Papageorge, Harbison, Roush, and Patton], Re: “EPA/PCB Press Conference”. Dec 22, 1975. <https://cdn.toxicdocs.org/85/XxDg2beZbar4LmveLaKEzOa/85XxDg2beZbar4LmveLaKEzOa.pdf>. Accessed 10 Sept 2018.
214. FDA Weighs a Cut in the Limit of PCB it Allows in Fish. *New York Times*, Nov 29, 1975, p. 31.
215. Dow Chemical to Sell Substitute for PCBs in Power Capacitors. *Wall Street Journal*, Dec 3, 1975, p. 22.
216. Halt to Using PCB Chemicals Sought by EPA. *Wall Street Journal*, Dec 23, 1975, p. 2.
217. Bukro C. EPA Urges End to PCB Poisons. *Chicago Tribune*, Dec 23, 1975, p. 12.
218. EPA Acts on PCB’s, Pesticides. *Science News*, 109 (Jan 17, 1976), 40.
219. Memo for the Record. “Subject: FJF Views on PCB’s [sic]”. Oct 28, 1975. <https://cdn.toxicdocs.org/N2/N2eLXeMjGb7pa85n5dXe91Q3w/N2eLXeMjGb7pa85n5dXe91Q3w.pdf>. Accessed 10 Sept 2018.
220. Organizational Chart, Monsanto Company. Nov 3, 1975. <https://cdn.toxicdocs.org/KJ/KJyke dBNBxXOnB3yy7pkajQXx/KJykedBNBxXOnB3yy7pkajQXx.pdf>. Accessed 19 Oct 2018.
221. Wilkins PR to Harbison EH. Report by PCB Study Group. “Confidential,” Dec 10, 1975. <https://cdn.toxicdocs.org/oD/oD9eaBXegaJmXyzyogR05pGE/oD9eaBXegaJmXyzyogR05pGE.pdf>. Accessed 10 Sept 2018.
222. Phase-out is set of PCBs chemical. *New York Times*, Jan 27, 1976, p. 54.
223. Monsanto to eliminate PCB fluid production. *Wall Street Journal*, Jan 27, 1976, p. 2.
224. Public Law 94-469. Toxic Substances Control Act, Oct 11, 1976. <https://www.gpo.gov/fdsys/pkg/STATUTE-90/pdf/STATUTE-90-Pg2003.pdf>. Accessed 12 July 2018.
225. Potter RG. Business director, functional products to General Electric. Oct 4, 1976. <https://cdn.toxicdocs.org/7M/7MbwDeeLQpM0bwK8k97bnX7g/7MbwDeeLQpM0bwK8k97bnX7g.pdf>. Accessed 19 Oct 2018.
226. National Cancer Institute, Carcinogenesis, Technical Report Series, No. 38, “Bioassay of Aroclor 1254 for Possible Carcinogenicity,” CAS No. 27323-18-8, NCI-CG-TR-38, 1978. <https://cdn.toxicdocs.org/5b/5beZ9pzNzYdOo0R16NM4EEyq8/5beZ9pzNzYdOo0R16NM4EEyq8.pdf>. Accessed 10 Sept 2018.
227. Berteau PE. Monsanto department of medicine and environmental health to R. C. Isham, “NCI Study of PCB”. May 30, 1978. <https://cdn.toxicdocs.org/rY/rYw1onnVqezxQkxwbpbDz7q/rYw1onnVqezxQkxwbpbDz7q.pdf>. Accessed 10 Sept 2018.
228. Dickinson AW. Monsanto statistician, to P.E. Berteau. June 2, 1978. <https://cdn.toxicdocs.org/Rj/RjrGqkvBkJbG2bBZZLapv86LV/RjrGqkvBkJbG2bBZZLapv86LV.pdf>. Accessed 10 Sept 2018.
229. Bishop DR. Monsanto director of communications to H.L. Stevenson. Dec 6, 1979. <https://cdn.toxicdocs.org/ZJ/ZJDD6zM9vRJevNg1MRdvmK1YO/ZJDD6zM9vRJevNg1MRdvmK1YO.pdf>. Accessed 10 Sept 2018.
230. “Note to Editors from Monsanto Company: PCB Hazards-Facts & Fallacies”. Sept 23, 1980, enclosure, Dan R. Bishop to OpUnit PR Directors, Subject PCBs, October 3, 1980. <https://cdn.toxicdocs.org/0V/0Ve4pmDBp20zJ9xn4Ko71ZGb/0Ve4pmDBp20zJ9xn4Ko71ZGb.pdf>. Accessed 10 Sept 2018.
231. WGK Today. Monsanto Company [newsletter] Sept 19, 1980. <https://cdn.toxicdocs.org/pe/pejpmvYqJwazYKd6aGejxk9mD/pejpmvYqJwazYKd6aGejxk9mD.pdf>. Accessed 10 Sept 2018.
232. Rosner D, Markowitz G. Educate the individual...to a sane appreciation of the risk: a history of industry’s responsibility to Warn of Job Dangers before the occupational safety and health administration. *Am J Public Health*. 106(Jan 2016), 28–35.
233. World Health Organization. International Agency for Research on Cancer, “Polychlorinated Biphenyls and Polybrominated Biphenyls,” IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, v. 107, (IARC, Lyon France, 2016). p. 439. <http://monographs.iarc.fr/ENG/Monographs/vol107/mono107.pdf>. Accessed 2 Feb 2018.
234. Hill AB. The environment and disease: association or causation? *Proc R Soc Med*. 1965;58:295–300.



Gerald Markowitz Ph.D., is Distinguished Professor of History at John Jay College of Criminal Justice and the Graduate Center, City University of New York, and Adjunct Professor, Sociomedical Sciences, Mailman School of Public Health, Columbia University. He is the recipient of numerous grants from private and federal agencies, including the Milbank Memorial Fund, National Endowment for the Humanities, and the National Science Foundation. Together with David Rosner, he has authored and edited books and articles on the history of public health, environmental health, and occupational safety and health, including *The Contested Boundaries of American Public Health*, New Brunswick: Rutgers University Press, 2008, with James Colgrove and David Rosner; *Are We Ready? The Public Health Response to 9/11*, Berkeley: University of California Press, 2006; *Dying for Work*, Bloomington: Indiana University Press, 1987; and *Slaves of the Depression: Workers' Letters about Life on the Job*, Ithaca: Cornell University Press, 1987. He is a member of the US National Academy of Medicine and a member of the JPHP Editorial Board.

David Rosner MS. (Public Health), Ph.D., is Ronald Lauterstein Professor of Sociomedical Sciences at Columbia's Mailman School of Public Health and Professor of History at Columbia University and Co-director of the Center for the History and Ethics of Public Health at Columbia's Mailman School of Public Health. He is the 2014 recipient of Sigma Xi's John P. McGovern Science and Society award and of a John Simon Guggenheim Fellowship and recipient of numerous grants from private and federal agencies, including the Milbank Memorial Fund, National Endowment for the Humanities, and the National Science Foundation. In addition to his works co-authored with Gerald Markowitz, he has authored and edited *"Hives of Sickness": Epidemics and Disease in New York*, New Brunswick, NJ: Rutgers University Press, 1995 and *A Once Charitable Enterprise: Hospitals and Health Care in Brooklyn and New York*, New York: Cambridge University Press, 1982. He is a member of the US National Academy of Medicine and a member of the JPHP Editorial Board.



EXHIBIT B

Exhibit Number	Doc Date	Description	Beg Bates
1	12/31/1930	Research Laboratory Swann Research Incorporated, Anniston Alabama, Review of Aroclor Situation from Stand-Point of Uses by H.J. Krass	PCB-ARCH0287220
2	2/20/1931	Swann Chemical Company, A Brief Description of the Aroclors	PCB-ARCH 0222096
3	3/1/1931	The Toxicity of Certain Benzene Derivatives and Related Compounds by Henry Field Smyth, M.D., Dr. P.E.; Vol. 13 No. 3 The Journal of Industrial Hygiene	LEXOLDMON001780
4	4/28/1932	Chemical Week Monsanto Advertisement, Skydrol... up there with more and more big names!	PCB-ARCH0232846
5	2/10/1933	Ltr from F.P. Cummings to Swann Chemical Company Aroclor Wax for Rendering Certain Papers Transparent of Moisture proof	DSW 312171
6	2/10/1933	Swann Chemical Company, "Aroclor as a Dielectric"	PCB-ARCH0222114
7	2/10/1933	Swann Chemical Company, "Aroclor Adhesives"	PCB-ARCH0222116
8	2/10/1933	Swann Chemical Company, "Aroclor as a Lubricant" by F.P. Cummings"	PCB-ARCH0222131
9	2/10/1933	Swann Chemical Company, "Aroclor for Extreme Pressure Lubrication" by F.P. Cummings	PCB-ARCH0222132
10	7/26/1933	Ltr from Eugene M. Quincy to Stockholder of Monsanto Chemical Co. re: Company earnings; increased earnings due to Swann Corp. acquisition	DSW 331347
11	5/25/1934	Report of Dr. Fredrick Flina of Patch Tests Made on Material Received from Swann Research, Inc.	DSW 002969
12	1/1/1935	Monsanto Chemicals of Swann Products Division - Product Reference Guide	HARTOLDMON0000444
13	1/1/1935	Index 1001 - 1601-725; Swan Chemical Company Swann Diphenyl 1/1/35, Technical Description and Properties; Diphenyl Uses and Applications; Swan Chemical Company Diphenyls as an Indirect Heating Medium 1/1/35	PCB-ARCH0222057
14	1/1/1935	Swann Chemical Company, "Biphenyl as an Indirect Heating Medium"	PCB-ARCH0222064
15	1/1/1935	Swann Chemical Company, "Various Uses of Aroclors"	PCB-ARCH0222073
16	1/1/1935	Swann Chemical Company, "Aroclor in Lacquers" Original 2/10/1933	PCB-ARCH0222118
17	1/1/1935	Swann Chemical Company, "Aroclor as Saturants"	PCB-ARCH0222128
18	1/1/1935	Monsanto, Monsanto, Thirty Fourth Annual Report	PCB-ARCH0239651
19	1/1/1935	The Swann Chemical Company Aroclor Use Code	STLCOPCB4072104
20	5/16/1935	Ltr from Monsanto President to Stockholders of Monsanto Chemical Company re: Merger approval	PCB-ARCH0239818
21	6/1/1935	Diphenyl and chlorinated Diphenyl Derivatives	DSW 001279
22	1/1/1936	Journal article entitled an Acneform Dermatergosis by Jones and Alden	MON-MT-003090
23	1/1/1936	F.B. Flinn and N.E. Jarvik, "Action of Certain Chlorinated Naphthalenes on the Liver," Proceedings of the Society for Experimental Biology and Medicine, 35 (1936), 118-120.	PCB-ARCH0132069
24	1/15/1936	1935 Annual Report of Research and Development Department Monsanto Chemical Company and Subsidiaries by G. DuBois, F.J. Curtis	WASHARCH 00028
25	3/16/1936	A Preliminary Report of the Dermatological and Systemic Effects of Exposure to Hexachloro-Naphthalene and Chloro-Diphenyl Special Bulletin No. 43	MONS 076193
26	6/1/1936	Louis Schwartz - Dermatitis from Synthetic Resins and Waxes, June 1936	WATER_PCB-SD00000032465
27	10/1/1936	Chemical Industries - New Nonflammable - type hydraulic fluid Vol. 39 No. 4 Jan-Dec 1936	No Bates
28	5/21/1937	Aroclor - Occupied by Sales Department-Phosphate Division	PCB-ARCH0089906
29	7/21/1937	Liver Lesions Caused by Chlorinated Naphthalene by Frederick B. Flinn and Norman E. Jarvir	DSW 245935

Exhibit Number	Doc Date	Description	Beg Bates
30	9/1/1937	Journal Article in Journal of Industrial Hygiene and Toxicology by Drinker et al. dated September 1937 titled "The Problem of Possible Systemic Effects from Certain Chlorinated Hydrocarbons"	MONS 096643
31	10/11/1937	L.A. Watt Memo	MONS 061332
32	1/1/1938	Monsanto sets up test site at U of Fla for soil tests – 1242; 1248; 1254	MONS 089532
33	2/1/1938	Article in The Journal of Industrial Hygiene and Toxicology - Morphological changes in the livers of rats resulting from exposure to certain chlorinated hydrocarbons, Volume 20, February 1938, Number 2, pages 97-123 Bennett and Drinker	LEXOLDMON008285
34	9/15/1938	Report to the Monsanto Chemical Company - Cecil Drinker M.D. Harvard School of Public Health	MONS 048123
35	2/1/1939	The Journal of Industrial Hygiene and Toxicology Vol. 21 #2 The Systemic Effects Resulting from Exposure to Certain Chlorinated Hydrocarbons by Leonard Greenburg, May R. Mayers and Adelaide Ross Smith	WATER_PCB-00054552
36	5/1/1939	Drinker et al., Further Observations on the Possible Systemic Toxicity of Certain of the Chlorinated Hydrocarbons with Suggestions for Permissible Concentrations in the Air of Workrooms, The Journal of Industrial Hygiene and Toxicology, Vol. 21, No. 5	TOXSTUDIES0085
37	6/28/1939	Termite Soil Poison Tests - Gainesville, Florida by Ira Hatfield	TOWOLDMON0060992
38	7/18/1939	Ltr from Ernest Trigg to Class a Members re: Confidential - Toxic material with problems	NCA 0 02901
39	5/1/1940	Plasticizers and Resins Monsanto Chemicals Serving Industry.. Which Serves Mankind	TOWOLDMON0039017
40	8/1/1940	Parlon New Paint Ingredient... Improves Many Finishes ad	No Bates
41	1/1/1941	Survey of Compounds Which Have Been Tested for Carcinogenic Activity from the Industrial Hygiene Digest	PLTEXP034258
42	12/1/1941	Monsanto, W. E. Alexander, "General Information Concerning the Handling of Aroclor 1254"	PCB-ARCH0388979
43	1/1/1942	Occupational Tumors and Allied Diseases by W.C. Hueper, M.D. from the Balor University College of Medicine Library	PLTEXP023196
44	10/14/1942	Trip Report 214 Westinghouse Electric and Manufacturing Company East Pittsburgh, PA October 14-15, 1942	DSW 331019; PCB-ARCH0239528
45	11/10/1942	Industrial Hygiene Foundation of America, Inc. Seventh Annual Meeting of Members	MT-001490
46	5/15/1943	An Outbreak of Halowax Acne (Cable Rash) Among Electricians by Louis Schwartz, M.D. - Aroclors	DSW 033795
47	7/1/1943	Alice Hamilton, "The Toxicity of the Chlorinated Hydrocarbons," <u>Yale Journal of Biology and Medicine</u> , 15 (July 1943), 787-801.	
48	8/1/1943	Article in Rubber Age Vol. 33 No. 5, Aug. 1943, titled "Observations on the Toxic Effects Resulting from Exposure to Chlorinated Naphthalene and Chlorinated Phenyls with Suggestions for Prevention" by Dr. H. Von Wedel, Dr. William A. Holla, and Dr. James Denton, pgs. 419-426	PCB-ARCH0027965
49	8/1/1943	Article - Chlorinated Naphthalenes and Diphenyls Lenard Greenburg	TOWOLDMON0054689
50	1/1/1944	Greenburg, Leonard, "Precautions in the Use of Chlorinated Naphthalenes and Diphenyls," <u>Chemical Industry</u>	PCB-ARCH0449114
51	1/1/1944	Annual Research Report 1944 from Washington Archive	WASHARCH 00261
52	4/8/1944	Ltr from J.L. Howerton to Mr. Barker re: General Electric is demanding too many tests on Aroclors and Pyranols	PCB-ARCH0239052

Exhibit Number	Doc Date	Description	Beg Bates
53	8/18/1944	Article by Miller in United States Public Health Service, 1944, entitled "Pathologic Changes In Animals Exposed To A Commercial Diphenyl"	MONS 098124
54	10/1/1944	Salesmen's Manual Aroclor - Monsanto Chemical Company	MONS 092643
55	1/1/1945	Warning Labels published by Manufacturing Chemists' Association of the United States Adopted 1945/Revised April 1946	No Bates
56	6/18/1945	Application Data Bulletin No. P-115, The Aroclors - Physical Properties and Suggested Applications 1946	TOWOLDMON0005503
57	1/1/1946	"Development Department Annual Research Report - 1946," Confidential Annual Research Report, 1946	WASHARCH 00078
58	1/16/1946	ANSI Committee C107 Use and Disposal of Askarel and Askarel-Soaked Materials in Electrical Equipment Meeting Minutes Jan. 12 & 13, 1976	PCB-ARCH0233556
59	3/1/1946	Monsanto Plasticizers and Resins Specifications and Application Data	DSW 579787
60	4/1/1946	MCA, L-1 Manual - Manufacturing Chemists Association, "Manual L-1 A Guide for the Preparation of Warning Labels for Hazardous Chemicals," Chemical Engineering News 23, no. 11 (1945): 992-996	RSV0030574
61	7/1/1946	The West Virginia Medical Journal article, Solving the Problem of the Toxicity of New Chemicals in industry by Henry F. Smyth, Jr.	PLTEXP035285
62	9/30/1946	Memo from M.A Pierle to J.C. Weber re: PCB's - ANSI-107	PCB-ARCH0530403
63	10/1/1946	Frederick B. Flinn, "Industrial Exposures to Chlorinated Hydrocarbons," <u>American Journal of Medicine</u>	MONS 097318
64	10/1/1946	Chemical Engineering Oct./ Dec. 1946 Ad for Monsanto Plasticizers and Resins and Aroclors	
65	11/1/1946	Monsanto Chemicals Soap and Sanitary Chemicals Enduring Quality; For Livestock DDT Sprays Santobane	WATER_PCB-SD0000083162
66	3/1/1947	Industrial Hygiene Foundation, Abstract of H. Smyth, "Solving the Problem of Toxicity of New Chemicals in Industry," Industrial Hygiene Digest, March, 1947	03118653
67	3/1/1947	"Look on the Bright Side," Johnson's Glo-Coat, March 1947	
68	9/1/1947	The Chemist Analyst Vol. 36, No. 2, page 33, J.T. Baker Chemical Co., September 1947 - On the Toxicity of the "Aroclors" Robert M. Brown	MONS 031540
69	10/7/1947	Monsanto News Press Release with highlighted text - R. Emmet Kelly stated "health problems associated with the nation's newer technology have emphasized the need for more immediate physiological and biological investigations."	WASHARCH 00011
70	12/30/1947	Letter from P. G. Ponieous (Development Department of Monsanto) to Central Research Laboratory, Celanese Corporation of America (NJ)	MONS 089439
71	1/1/1948	Aroclors as Used in Chlorinated Rubber Technical Bulletin No. P-124	TOWOLDMON0005065
72	1/29/1948	Santobane (DDT) Data compiled by H.C. Godt, Jr. Private Consultant	HARTOLDMON0000304
73	3/1/1948	Aroclors as Used in Polite S-5 Monsanto Technical Bulletin No. P-126 3/1/1948	DSW 322919
74	4/27/1948	Final Report on Aroclor Data Book Report # 2215, Job No. 171-451; File No. 141-27.1 Research Dept. Phosphate Division by: R.R. Knight; Chemists: A.M. Ellenburg, R.R. Knight	HARTOLDMON0004843
75	7/1/1948	Benignus to E.E. Knipping, U.S. Dept of Ag., Washington, DC re: discussion about further field testing of Aroclors at the Orlando, Florida and Kerrville, Texas stations	PCB-ARCH0043460
76	9/1/1948	Monsanto Technical Bulletin No. P-132 Aroclors - As Used to Extend or Substitute Carnauba Wax	DSW 322957

Exhibit Number	Doc Date	Description	Beg Bates
77	11/1/1948	Monsanto Technical Bulletin No. P-134 Aroclor 1254 Co-Plasticizer with DOP for Vinyl Organosols and Pastes	DSW 550931
78	1/1/1949	Chlorinated Diphenyl and the Chloro-naphthalenes, Toxicity in Industrial Toxicology by L. T. Fairhall, (Public Health, Inc.), 1949	MONS 046928
79	1/1/1949	L. Fairhall, "Chlorinated Diphenyl and the Chloronaphthalenes," Industrial Toxicology, pp. 257-258, (1949 ed)	No Bates
80	3/24/1949	S.A. Rohwer, Acting Chief of Bureau US Dept of Ag, Agricultural Research Administration, Bureau of Entomology and Plant quarantine to Monsanto chemical Company.	PCB-ARCH0043430
81	3/28/1949	Monsanto Technical Bulletin No. P-137 Aroclor A Nonflammable Hydraulic Fluid for Die-Casting Systems	DSW 322987
82	4/4/1949	Monsanto technical bulletin P-138, April 4, 1949 Aroclor 1254 Lubricants and plasticizer in the manufacture of paper draperies	MONS 078331
83	4/25/1949	Ltr from Philip P. Wallace to Bailey B. Pepper, New Jersey Agricultural Experiment Station re: the Investigation and development of mosquito larvacides and repellents	MONS 087735
84	7/1/1949	An Indirect Aroclor Heater for Unit Chemical Operations by Meade McArdle, L.C. Garrett, and P.G. Benignus	DSW 260892
85	7/9/1949	E.F. Knipling, U.S. Dept of Ag to Benignus, Development Department re: We appreciate receiving the information regarding the solubility of DDT in various aroclor compounds	PCB-ARCH0043458
86	8/30/1949	Memo from Strachan to Barrett re Aroclor Toxicity Summary of References	MONS 095208
87	9/1/1949	An Indirect Aroclor Heater for United Chemical Operation Monsanto Technical Bulletin No. P-130	DSW 550940
88	10/18/1949	Minutes, Board of Directors of Manufacturing Chemists Association held on Oct. 11, 1949 - Members were presented with copy of the revised Manual L-1, 'Warning Labels.' Labeling principles	
89	2/6/1950	Memo from R.B. K. for file re: Aroclor - concerning the toxicity of two workers who were involved with Aroclor vapors	MONS 095143
90	2/6/1950	Ltr from Louis W. Spolyer to Toxicology Department re: Indiana industries is using your Aroclor 1248 (tetrachlorodiphenyl) as a heat transfer media in the extrusion of Tenite 2 plastic	PCB-ARCH0569778
91	2/14/1950	Letter from Emmet Kelly to Dr. Spolyar regarding toxicity of aroclor; cc: Benignus; Presentation of the PCB Management Plan, 1970	M11678
92	2/17/1950	Aroclors Used in Combination with Santophen* 20 (Pentachlorophenol Technical) In the Preparation of Wood-Treating Formulation and Soil-Poisons Monsanto Technical Bulletin No. P-141	TOWOLDMON0034627
93	2/28/1950	Almost every American benefits every day from the products of Borg-Warner & This was Adam's Bug Killer	PLEXP0051119
94	5/1/1950	Aroclor A Nonflammable Hydraulic Fluid for Die-Casting Systems - Monsanto Technical Bulletin No. P-137	MONS 074294
95	10/1/1950	Cumar Barrett Paracoumarone -Indene Resin Price Schedule	WATER_PCB-SD0000079910
96	1/1/1951	A Guide for Formulating Santobane, Monsanto DDT St. Louis	PLEXP0051306
97	1/20/1951	Chemical Industries Week - New Nonflammable - type hydraulic fluid Vol. 68 Jan-June 1951	DFP000048
98	11/15/1951	MCA, Minutes of Meeting, Plastics committee re: Chemicals in Foods....	CMA 078134
99	11/17/1951	Chemical Week article "Proof of Pydraul F-9 Safety" Vol. 69 July - Dec. 1951	DFP000050

Exhibit Number	Doc Date	Description	Beg Bates
100	12/17/1951	Aroclors: Toxicity - Haywood, Hamer, Ritchie, Newman, Kulifay, Weddell, Marshall, Mather - follow up letter to 12/11/1951 re: Toxicity	MONS 095204
101	2/16/1952	Chemical Week Feb. 16/ Chemical & Engineering News Feb. 25, 1952 Articles, Phenylacetic acid and derivates worth investigating; 5 reason for Santomerse No. 1; For Metal Surfaces to to bottom protection; Plasticizer HB-40 Ok for vinyls	PCB-ARCH0232843
102	2/29/1952	Letter from P.G. Benignus to T.K. Smith, Jr. re agreement between the U.S. Public; Agreement between the U.S. Public -- Service & the manufacturers of chlorinated naphthalenes, chlorinated diphenyls and chlorinated diphenyl oxides - T.K. Smith, Jr., Benignus	MONS 094551
103	3/3/1952	American Paint Journal article titled All-around protection, dated March 3 and August 25, 1952	PCB-ARCH0232840
104	9/30/1952	Press Release, Agricultural Research Administration, U.S. Department of Agriculture.	PCB-ARCH0042593
105	11/3/1952	Lindane-chlorinated polypenyl insecticide combinations (Bureau of Entomology and Plant Quarantine, U.S. Dept. Agriculture)	PCB-ARCH0042860
106	11/26/1952	Lindane-Aroclor Combinations Monsanto Chemical Company Phosphate Division	PCB-ARCH0042604
107	12/3/1952	Memo from Benignus to E.P. Rucker re: Aroclors - Biological Applications	PCB-ARCH0042833
108	1/1/1953	Saturday Evening Post Ad: Found! Three industries that can't use	No Bates
109	2/3/1953	Monsanto Lindane-Aroclor* Combinations Bulletin No. EX-43	TOWOLDMON0037820
110	2/20/1953	Ltr from R. Emmet Kelly to Mr. Donald F. Starr re: Toxicity of Aroclor 5460	PCB-ARCH0042819
111	4/1/1953	Monsanto Plasticizers in Synthetic Resin Adhesives Technical Bulletin No. 0-99	DSW 579692
112	6/17/1953	Monsanto Interim Report on Aroclor in Gases, Research Department Phosphate Division Report No. 2892 Job No. 171-1089 by H.B Richards Jr., H.B. Richards Jr.	MONS 058945
113	6/29/1953	Monsanto, Phosphate Division, Sales Department, Benignus. To "all Phosphate Division Salesmen. Subject: Aroclor—Extreme Pressure Lubricating Additive for Greases and Gear Oils."	PCB-ARCH0095474
114	6/30/1953	Progress Report Job No. 117-2542 Reported by Philip P. Wallace, William E. Spring, Paul D. McDonald Title: Insecticide Special Problems - Aroclor Combinations	PCB-ARCH0043106
115	7/13/1953	Memo from PG Benignus to All Phosphate Division Salesmen re: Aroclor Patents with attachment Patents Relating to the Use of Aroclors as Plasticizing Flameproofing and Pacifying Agents for Plastics, Particularly Vinyl Plastics	PCB-ARCH0090423
116	9/1/1953	Letter in response to ATB memo - 8/11/53 from Elmer P. Wheeler to Mather; cc: Smith, Beauregard, Benignus, Barrett, Gardner, Strickley, Dyson	MONS 095187
117	9/9/1953	Scientific Associates Certificate of Analysis subject: The Chlorance Producing Potential of Aroclor 5460, Lots 83 and 113 by Fred M. Younger	PCB-ARCH0069697
118	10/1/1953	Monsanto Technical Bulletin No. P-116 Montar Revised 8/56	TOWOLDMON0034383
119	11/1/1953	Monsanto Technical Bulletin, No. P-149, "Aroclors in formulating High Styrene Copolymer Surface Coatings"	TOWOLDMON0004832
120	1/1/1954	Seven Workers Develop Choracne in Plant using Aroclor	MONS 037714
121	2/8/1954	Hamer of Monsanto to J.W. Barrett, London, "Aroclor Toxicity,"	MONS 095192
122	2/12/1954	Letter from Emmet Kelly to Newman - Newport, England	MONS 095193
123	3/15/1954	Monsanto Final Report 2970 on Aroclor in Gases	DSW 147758
124	3/15/1954	Aroclor toxicity in paints - Ellenburg to Mather	MONS 095186

Exhibit Number	Doc Date	Description	Beg Bates
125	3/18/1954	Letter from Mathor to Dr. J. W. Barrett (London) re Aroclor Toxicity, dated March 18, 1954	MONS 095184
126	4/24/1954	Meigs J.W. AlBom J.J. and Kartin B.L. (1954) Chloracne from an unusual exposure to Aroclor. Journal of American Medical Association, 154, 1417 – 1418	MONS 097316
127	6/1/1954	Charles Henri Hine and N.W. Jacobsen, "Safe Handling Procedures for Compounds Developed by the Petro-Chemical Industry," (Shell), [American] Industrial Hygiene quarterly, 14 (June 1954), 141-144	No Bates
128	6/10/1954	Salesman's Report and Contract Data Mylan, Inc; Buyers: Mr. V.J. Mylan, M.D. Schoenbeck, and R.L. Wolfe, G.E. Gibson, & H.I. Armstrong re: 1200 pounds of Aroclor 1262	PCB-ARCH0042594
129	6/28/1954	How Monsanto Controls Air and Water Pollution by Dr. H.E. Morriss	WATER PCB-SD0000054823
130	9/13/1954	Scientific Associates Certificate of Analysis subject: The Toxicological Investigation of Fluid OS-57 Test Conducted for Monsanto	STLCOPCB0005503
131	9/28/1954	Ltr from Jos F. Stickley to Dr. J.A. Gardner re: Effect of Aroclors on Vegetation	PCB-ARCH0577540
132	1/1/1955	Sales of Aroclor, 1955 Sales Value by Application	HARTOLDMON0000355
133	1/1/1955	Sanford J. Hill (DuPont), "The Manufacturing Chemists Association Labeling Program," Transactions of the Seventeenth Annual Meeting of the American Conference of Governmental Industrial Hygienists, April 23-26,	
134	4/1/1955	Process for the Production of Aroclors, Pyranols, Etc. At the Anniston and At the WM. G. Krummrich Plant - E. Mather	MONS 045979
135	4/12/1955	Warren Easley, Monsanto, Washington, DC to Elmer Wheeler, Main office "U.S. Navy: Hydraulic fluids," re: Navy is testing Pydraul 150 for possible use in submarines	PCB-ARCH0621806
136	6/22/1955	Kettering Report - The Toxicity of the Vapor of Aroclors 1242 and 1254	MONS 050202
137	6/30/1955	Technical Sales Report, U.S. Department of Agriculture, dated June 30, 1955	MONS 034033
138	7/5/1955	Kettering Report - The Toxicity of the Mist Generated by the Aspiration of Pydraul	MONS 050186
139	7/25/1955	Ltr from Chas Williams to Mr. J.M. Magner Org. Development Dept. re: Aroclor-Insecticide Customers	PCB-ARCH0042917
140	8/19/1955	Letter to J.W. Barrett - Aroclors - Toxicological Examination	MONS 095215
141	8/29/1955	Letter from Elmer P. Wheeler to Joseph F. Teron re: Correspondence regarding Pydraul F-9 and Pydraul 150 not containing the same components	MONS 09839
142	9/8/1955	Aroclor toxicity in paints - Barrett to H.K. Mason CC: Dr. Newman	MONS 095194
143	9/20/1955	Aroclor toxicity in paints - Emmet Kelly to Barrett - Response to memo September 8 to Mr. Nason	MONS 095196
144	11/14/1955	Department 246 (Aroclors) - Letter from Jack Garrett to Patrick (Krummrich Plant); cc: Creasce, Lieben, Webber	MONS 093616
145	11/16/1955	20th Annual Meeting - Industrial Hygiene Foundation Transactions Bulletin No. 29 - The Economics of Industrial Health by A.R. Fisher	
146	11/23/1955	A.M. Ellenburg, Monsanto, Organic Chemicals Division, "Final Report on Aroclor 1248 as a Heat Transfer Medium in a Lamont Forced Circulation Heater,"	HARTOLDMON0005136
147	12/6/1955	Toxicological Examination - Aroclor Toxicity in Paints, Hardy to Barrett	MONS 095188
148	1/1/1956	Brief Description of Aroclors, Their Sales and Uses	PCB-ARCH0163243

Exhibit Number	Doc Date	Description	Beg Bates
149	1/31/1956	"Federal Food, Drug and Cosmetic Act (Chemical Additives in Food)" Hearing before a Subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, 84th Cong. 2nd Sess. (Washington: GPO, 1956)	
150	4/1/1956	Ad in <u>Modern Plastics</u> for Plasticizers, including Aroclors Apr./ June, Oct., Dec. 1956	
151	4/10/1956	Letter from E. P. Wheeler to Dr. R. E. Kelly (Main Office): Hydraulic Fluid Discussion with Captain Stone – U. S. Navy	MONS 095628
152	5/1/1956	The proper handling of aroclors and their mixtures in the electrical industry	TOWOLDMON0002680
153	5/29/1956	Monsanto Memo - Pydraul 150	MONS 095631
154	6/1/1956	Presentation by Treon of Kettering Laboratory dated 4/26/56 entitled "The toxicity of the vapors of Aroclor 1242 and Aroclor 1254	MONS 096370
155	6/7/1956	Monsanto Memo - Pydraul 150	DSW 148006
156	7/25/1956	Letter from Wheeler to H.W. Speicher Industrial Hygiene Westinghouse re: reference to Treon study in June 1956 issue of AIHA notes Treon proposal of standards for 1242 and 1254 but not similar data on Aroclor 1260	GBRN003396
157	8/15/1956	Development Department Monsanto Organic Chemicals Division Report - Liquid Dielectrics and Aroclor Market Survey by John S. Harris 8/15/1956 O.D. 1134	HARTOLDMON0000346
158	9/1/1956	Aroclor Obsolete 9/56	MONS 071541
159	10/1/1956	Pydraul AC Fire-Resistant Compressor Lubricant Monsanto Technical Bulletin No. O-133	PCB-ARCH-EXT0020868
160	12/26/1956	Pydraul 150 - U.S. Navy, Letter from Elmer Wheeler to Sido; cc: Davis, Langenfeld, Litzinger; bcc: Treon	MONS 095637
161	1/1/1957	Toxicity Considerations in Pollution Control by Jack Garrett Garrett 1957 article	WATER_PCB-SD0000078531
162	1/21/1957	Letter from R. Emmet Kelly to Mr. H. I. Armstrong re Pydraul 150	MONS 095640
163	2/20/1957	Ltr from Kelly to C.D. Pepperman, Crucible Steel Company re: Requested to send toxicity data on Pydraul 150.	PCB-ARCH0621926
164	3/1/1957	Chemical Specialties Data Report Monsanto Aroclor Resins for Insecticide Formulations	PCB-ARCH0736491
165	3/21/1957	Letter from Richard Davis to Jake Arbogast re: Using Pydraul 150 in hydraulic system of forging manipulator manufactured by Salem Brosius of Pittsburgh	WATER_PCB-SD0000043378
166	4/1/1957	Aroclors as Agricultural Chemicals by J. M. Magner OD 1149	PCB-ACRH0043485
167	4/1/1957	Henry F. Smyth, "The Communications Lines and Problems of a Toxicology Laboratory Working for Industry," <u>AMA Archives of Industrial Health</u> , 15 (April, 1957), 269-273.	
168	4/8/1957	Ltr from Wheeler to James O. Lofstrom re: toxicity data on Pydraul y-9, Pydraul 150, Pydraul 600, ad Pydraul AC fluids	MONS 091001
169	4/15/1957	Ltr from Wheeler to F.S. Nisson, Pure Oil Company re: Monsanto had been asked for toxicity data on Pydraul AC	PCB-ARCH0622876
170	4/20/1957	Chemical Week, Aroclor 5460 Making New Specialty Markets for Inspections pg. 13 & See for yourself why Monsanto is your best source for detergent chemicals	No Bates
171	5/1/1957	Aroclor - Resins and Plasticizers for Chlorinated Rubber Technical Bulletin O-124	TOWOLDMON0046084
172	6/3/1957	Ltr from Elmer P. Wheeler to Allen D. Brandt re: Toxicity data on Pydraul	MONS 091006
173	7/9/1957	Letter from P.G. Benignus to Ed Schwerth re: Aroclor Heater for Donuts	DSW 343531

Exhibit Number	Doc Date	Description	Beg Bates
174	8/30/1957	PGB Sales Information Bulletin 8-27-57 OD 1149 - "Aroclors As Agricultural Chemicals", 4-1-57 by JMM - Aroclor Use to Increase this Insecticidal Life of Lindane - Benignus, Caspari, Koehler, Magner, Maxwell, Starrett, Throdahl, Sherwood	MONS 092048
175	9/11/1957	Pydraul 150 - Langenfeld, Litzsinger, Wheeler, Sido	MONS 095645
176	9/25/1957	Toxicity of Pydraul 150 - Letter from Wheeler to Slayton; cc: Lungenfelt, Litzsinger	MONS 095646
177	11/4/1957	Ltr from George Dean & C.L. Morris to P.G. Benignus re: Oct. 31 10% recommendation of 100 pounds of Aroclor 5460	PCB-ARCH0043097
178	1/14/1958	Ltr from Roger E. Hatton to Elmer P. Wheeler re: Toxicity Studies: 05-95	DSW 586278
179	2/24/1958	Ltr from E.L. Hedworth, Anniston to Benignus, "Ohio Brass Company Aroclor Pumps" re: Use 2 types of pumps in the Aroclor refining section.	PCB-ARCH0393067
180	5/1/1958	Agricultural Chemical Product Development Call Report re: Aroclors	PCB-ARCH0043081
181	6/1/1958	Engineering Heat Transfer Data for use with Aroclor 1248 a fire-resistant, heat-transfer agent that operates up to 600F in the liquid phase	PCB-ARCH-EXT0021038
182	6/26/1958	Ltr from H.S. Litzsinger to Wheeler re: field evaluation of OS-95 underway to become a sales item by the first of the year	PCB-ARCH0623437
183	7/8/1958	Ltr from Wheeler to Mr. H. Stu Litzsinger re: Toxicity of OS-05	MONS 095674
184	8/18/1958	Ltr from Kelly to E.E. Edmondson, Jr., Safety Director, Texas Eastern Transmission Corp re: "OS-81"	HARTOLDMON0025971
185	8/26/1958	Letter from Emmet Kelly to George Saunders re: Labeling materials with chlorinated hydrocarbons "Do not breathe fumes"	MONS 090882
186	8/27/1958	Note from R. Emmet Kelly re: Mobil Nyvac A is to go on the drums of Pydraul F-9 or Pydraul 150	PCB-ARCH0621962
187	12/1/1958	Hervey B. Elkins, ed., <u>The Chemistry of Industrial Toxicology</u> , p. 152-3: chlorinated Diphenyls: "Harmful effects: Irritation, Liver Damage; Degree: Can be Serious.	MONS076152
188	12/5/1958	Letter from D.F. Smith to R.D. Minter re: Pydraul labeling law changes	MONS 100151
189	12/15/1958	Notification re: Advising of harmful toxic pydraul vapors from compressed air piping systems	WATER_PCB-SD0000043379
190	12/19/1958	Ltr R.D. Minter & R. Emmet Kelly, M.D. to D.F. Smith re: Labeling	PCB-ARCH0187652
191	12/29/1958	Ltr from Elmer P. Wheeler to Mr. Litzsinger re: Toxicity Reports on OS-95	MONS 098069
192	1/28/1959	Letter from Richard Davis to M.K. Chapin regarding Precautionary labeling on Pydraul containers	MONS 088387
193	6/22/1959	Monsanto, Research Dept., Dayton, OH, "Report on Instrumental Analytical Conference, New Developments, Held at R & E Division,	HARTOLDMON0004980
194	6/22/1959	Monsanto Research Dept. Report on Instrumental Analytical Conference New Developments Held at R&E Division, Dayton June 22, 23, 1959	PCB-ARCH0293104
195	6/23/1959	Pydraul AC - Letter from Emmet Kelly to O. F. Hessel; cc: Camargo, Langenfeld	MONS 098053
196	9/30/1959	Ltr from Emmet Kelly to H.H. Boettcher, Air Products, Inc. re: concerns about the effect of Pydraul in stream pollution	MONS 091023
197	10/23/1959	Letter from Elmer P. Wheeler of Monsanto, to H. Wilbur Speicher of Westinghouse	MONS 090349
198	11/5/1959	Memo from Richard Davis to R.E. Kelly - A-2-S re: Air products, Inc. Allentown, PA	WATER_PCB-SD0000043387
199	11/16/1959	Letter from Jack T. Garrett to H.H. Boettcher re: Pydraul AC in water	WATER_PCB-SD0000043388
200	1/8/1960	Organic Chemicals Division Research; St. Louis Research Report #2420; Final Report on Assistance to Sales and Development Departments on Aroclors, Biphenyl and related Products - 1954 written by A.M. Ellenburg	HARTOLDMON0005218

Exhibit Number	Doc Date	Description	Beg Bates
201	2/4/1960	Memo from Jack Bonavogella to Dr. Kelly (handwritten in) re: Allied Chemical & Dye Corporation	MONS 097895
202	2/8/1960	Allied Chemical & Dye Corporation Aroclor 1254 - Wayeff, Zeppenfeld, Benaveglis, Emmet Kelly	MONS 097894
203	2/15/1960	Ltr from Elmer P. Wheeler to Anna M. Baetjer, The Johns Hopkins University re: chlorinated diphenyls or Aroclors involved in the Halowax difficulties in the mid and late 30's	MONS 088363
204	3/4/1960	Product Questionnaire to be filled in by Chemist - Aroclor compound No. 1260	MONS 089820
205	3/17/1960	Part 121 - Food Additives: Subpart A ... Substances Migrating from Adhesives Used in Food Packaging, Federal Register, p. 2203-04	PCB-ARCH0549971
206	5/1/1960	The Aroclor Compounds, Monsanto, hand dated 5.60 and 5.62 obsolete	TOWOLDMON0005563
207	8/29/1960	Monsanto Letter Garrett to Facini -Pydraul Fluids Hydrocology	MONS 091044
208	9/1/1960	Adhesives Age 1-3 1958-60 New compounding guidebook shows how 25 Monsanto Plasticizers can help solve many adhesives problems	LEXOLDMON004119
209	9/1/1960	Ltr from Wheeler to Stephen B. Logan, American Mutual Liability Insurance Co., Louisville, KY	MONS091119
210	10/18/1960	Ltr from Richard Davis to the Frito Company	STLCOPCB4083960
211	12/1/1960	Technical Bulletin No. PL-306, December 1960	TOWOLDMON0046268
212	1/1/1961	Modern Plastics 12/1960 - How to "Build In" High Resistance to Fire and Chemicals with Low-Cost Aroclor Plasticizers and Resin Extenders 1/1961	TOWOLDMON0047972
213	1/1/1961	Monsanto Genie of 1001 compounding jobs	TOWOLDMON0047967
214	1/13/1961	Salesman's Call Report, Pittsburgh Metallurgical Co, Calvert City, KY re: Re use of Pydraul A-200.	MONS080376
215	1/31/1961	Salesman's Call Report - Customer Pittsburg Metallurgical Co., Contacted - Paul Prozeller re: Prydraul A-200, 150, encountered difficulties using Pydraul A-200 in their furnace at low temperature following a weekend shut down	MONS 080376
216	2/1/1961	Plasticizer Patter 1961 - for Salesman's Use Only	627503
217	2/2/1961	Letter from R. Emmet Kelly to Mr. Richard Davis - interoffice memo - Mr. Allen Hexagon Laboratories	MONS 097419
218	2/14/1961	Letter from Joseph P. Allen to Dr. Kelly - Hexagon Laboratories attention to Dr. Emmet Kelly	MONS 089413
219	2/16/1961	Ready to work for you .. Aroclors, "Genie" of a Thousand and One Engineering Feats	TOWOLDMON0047970
220	2/17/1961	Ltr from Emmet Kelly to Joseph P. Allen re: response letter regarding employees exposure and hospitalization to Aroclor vapors	MONS 089412
221	3/1/1961	Monsanto Aroclor Resins for Insecticide Formulations No. CS-6; Monsanto Chemical Specialties Data Report	DSW 313529
222	6/19/1961	Ltr from Elmer P. Wheeler to Ken R. Doremis re: Two reprints of the publication by Joe Treon on the toxicity of Aroclors 1242 and 1254.	MONS 090353
223	7/18/1961	Eby letter to Bergen	MONS 096859
224	8/3/1961	Letter from Elmer P. Wheeler to Dr. Kenneth H. Maddy (General Offices): Aroclor 1242 -- Article by Professor B. J. Odell," August 3, 1961	MONS 097909
225	9/1/1961	Maddy letter to Wheeler	DSW 554431
226	9/12/1961	Part 121 Food Additives; Adhesives, Federal Register, pp. 8509 - 8513	PCB-ARCH0549972
227	10/23/1961	Letter from C. J. Eby re Aroclors - FDA	MONS 096860
228	12/1/1961	Adhesives Age Ad 4-5 1961-62 The Ubiquitous Aroclor "Genie" Does it Again	No Bates

Exhibit Number	Doc Date	Description	Beg Bates
229	1/1/1962	McCune EL, Hydropericardium and Ascites in Chicks Fed a Chlorinated Hydrocarbon, Poultry Science, 1961, 41, 295-299	MONS 096116
230	1/1/1962	Rachel Carson, <u>Silent Spring</u> p. 58: "Seemingly moderate applications of insecticides over a period of years may build up fantastic quantities in soil. Since the chlorinated hydrocarbons are persistent and long- lasting, each application is merely added to the quantity remaining from the previous	
231	1/19/1962	Wheeler letter to Jackson	DSW 554432
232	3/13/1962	Letter from R Emmet Kelly, M. D. to File re: Dr. Marcus Key, U. S. Public Health Service, Division of Occupational Health stated he was in St. Louis to investigate a chloracne epidemic at the International Bent Glass	MONS 096766
233	3/15/1962	Letter from R. Emmet Kelly to Marcus Key re Aroclor Plasticizers; Presentation of the PCB Management Plan, 1970	MONS 088309
234	3/20/1962	McHugh, Knapp, Roush, Organic Chemicals Division, St. Louis, "Heat Transfer Fluids"	PCB-ARCH0089410
235	3/27/1962	Letter from K. H. Moddy (General Office, Monsanto) to H. S. Bergen, Jr.	MONS 097442
236	4/9/1962	Kelly to Bill Maddox, Monsanto, NY (telegram) re: not expect that a starch adhesive containing 35 to 40 per cent Aroclor 5460 would require a warning label	PCB-ARCH0069571
237	4/25/1962	Letter from H Wilbur Speicher to Wheeler re: Maximum temperature for capacitor inerteens and transformers inerteens can be heated before local exhaust ventilation is provided	MONS 087904
238	5/4/1962	Message by A.W. Mempelmann, Seattle re: Dr. Emmet Kelly & Richard Davis R. re: May 3, 1962 Ltr J.E. Flynn M.D. Everett Clinic - Patient exposed to vapors from a pydraul product	MONS 071292
239	5/14/1962	Letter from J. E. Flynn (The Everett Clinic) to R. Emmet Kelly re exposure to Pydraul AC	MONS 091076
240	7/11/1962	Memo from Elmer P. Wheeler to Mr. Thomas Jacobs, Prairie States Oil and Grease Company re: Aroclor 5460 is terpyenyl, chlorinated to the extent of 60%	PCB-ARCH0069575
241	7/13/1962	Younger Laboratories Certificate of Analysis Subject: Toxicological Investigation of: Aroclor 5460 Monsanto Sample Number 48, Monsanto Project Number Y-62-46	PCB-ARCH0069723
242	7/17/1962	Ltr from Richard Davis to "All District Managers" "Therminol – Industrial heat Transfer fluid Program re: "Effective August 1, 1962 Aroclor will no longer be offered for heat transfer applications. We will instead market these fluids under the trademark Therminol"	TOWOLDMON0055780
243	8/1/1962	Fire-Resistant Fluids Give new Safety to Heat Transfer," Reprinted from Factory Insurance Association, <u>FIA Sentinel</u>	PCB ARCH 0088703
244	10/1/1962	The Desolate Year - Monsanto Magazine	No Bates
245	10/12/1962	Complaint No. 110-Q-62; Product Pydraul AC, Boeing; "Type of Complaint: Carbonizing"; "Has customer checked equipment to determine if there has been any accidently product leakage past the piston rings which when combined with our product could cause the carbon deposits on the compressor exhaust valves."	WATER_PCB_SPO00000228
246	11/27/1962	Letter from R. Emmet Kelly to FILE re exposure from molten aluminum dropping into puddles of Pydraul A-200	MONS 098084
247	12/18/1962	Ltr from Kelly to Richard Body, Steel Company of Wales re: Tox information on Pydraul 150.	PCB-ARCH0621718
248	1/1/1963	Monsanto's 1963 Annual Report	MONS 352075

Exhibit Number	Doc Date	Description	Beg Bates
249	1/1/1963	Irving Sax, <u>Dangerous Properties of Industrial Materials</u> , p. 25; 596 Table 7: Occupational Poisons which May Produce Abnormalities in Liver Function," "Chlorinated diphenyls"	PCB-ARCH0148361
250	1/1/1963	Frank A. Patty, Industrial Hygiene and Toxicology re: Cites Drinker, Treon et al.	PCB-ARCH0305839
251	1/23/1963	Message by J. Orem Detroit re: Richard Davis - Having trouble with Pydraul A-200 Lines	MONS 071306
252	3/20/1963	Ltr from Wheeler to L.N. Rodenhouse, Acme Protection Equipment company, South Haven, MI re: Re: Pydraul A-200	MONS091153
253	4/1/1963	Aroclor 1221, 1232, 1242 for Polyvinyl Acetate-Emulsion Adhesives, Technical bulletin No. PL-321	PCB-ARCH-EXT0012892
254	5/27/1963	Memo from Chas M. Williams to P.E. Heisler, Krummrich re: Electrical Utilities, LaSalle, Illinois	PCB-ARCH0212207
255	7/25/1963	Ltr from Emmet Kelly to A.R. Hempel re: request for composition of Aroclor 1254 and 5460	PCB-ARCH0736677
256	11/1/1963	Chemical Specialties Data Report Aroclor Compounds	0509197
257	2/10/1964	Ltr from Wheeler to William L. Sutton, Eastman Kodak Company re: On FR-1	MONS090374
258	5/14/1964	Monsanto Appropriation Request to The Executive Committee: Sommer, Christian, Gillis, Mueller, O'Neal, Thomas, Williams, Hoyer - Title: Expand Aroclor Production at W.G. Krummrich and Anniston Plants	PCB-ARCH0015227
259	5/27/1964	Letter from Elmer P. Wheeler to Frank T. Nemits: Aroclor 1232: Federal Hazardous Substances Labeling Act	MONS 097865
260	5/28/1964	Monsanto Meeting of the Board of Directors - 5/14/1964 Memo of Mr. R. M. Morris recommending expenditure of \$750K to expand Aroclor production at the Anniston plant	STLCOPCB4002928
261	6/1/1964	Wheeler to Charles J. DeSimone, Pratt & Whitney Aircraft, CT	PCB-ARCH0569131
262	6/24/1964	Letter from M. N. Johnson, M. D. to J. M. Campbell MCL - London re: replying to your inquiry concerning Aroclors	MONS 096861
263	7/30/1964	Ltr from Elmer P. Wheeler to Mr. J.O. Schiltz re: Toxicity and safe handling of Therminol FR products	STLCOPCB4008168
264	8/4/1964	Memo from J.W. Campell to Emilio re: S.A.E. De Condensadores De Trevoux	MONS 097945
265	11/4/1964	M. N. Johnson, MD to Ray Stone, Morningstar Paisley, Inc., Chicago, IL Re: "any hazard in the use of Aroclor 5460 as a plasticizer in P.V.A. adhesives heated to 300F."	PCB- ARCH 0069584
266	11/9/1964	Ltr from Jennings Fershing to Monsanto Chemical Company re: Medical Division Urgent; doctor identified Pydraul-901 in patient	MONS 091163
267	11/20/1964	Dave Wood, London to Benignus "Pyroclor"	PCB-ARCH0036868
268	1/1/1965	Hygienic Guide Series Chlorodiphenyls	MONS 076148
269	1/1/1965	Chlorodiphenyls 42%-54% (or 60"/v) PCB; Warning label for PCB in the environment Jan-Feb 1965	PCB-ARCH0025009
270	1/14/1965	The Environment and Disease: Association and Causation? By Sir Austin Bradford Hill	No Bates
271	1/21/1965	Kelly to M.J. Monahan, Acorn Chemical Company, Cleveland, OH	PCB-ARCH 0069585
272	1/25/1965	Ltr from R. Emmet Kelly to Mr. Richard Davis re: Autoclave leakage into the insulation of Pydraul A-200	MONS 098092
273	3/1/1965	Ltr from T.M. Steadman to Monsanto Canada Ltd. Re: Ill effect of Inerteen in a persons skin and lungs	MONS 090434

Exhibit Number	Doc Date	Description	Beg Bates
274	3/1/1965	Receiving Report from Jack Cole, to J.C. Beard re: Inerteen PPO, damaged drum leak	PCB-ARCH0402494
275	3/11/1965	Ltr from Elmer P. Wheeler to M.J. Monahan re: data for Aroclor 5460	PCB-ARCH0069586
276	5/6/1965	Ltr from H.L. Gray to Mr. G.R. Sido re: Leaking drum from Therminol FR-2 was refused & returned to Monsanto	PCB-ARCH0368130
277	5/14/1965	Richard Davis, Market Manager to Mr. J.M. Kerr re: Leakage of Pydraul and plunger lubricant from die casting machines flow	110309
278	6/15/1965	Therminol FR Fluid Heat Systems Engineering Heat Transfer Data	TOWOLDMON003110
279	6/17/1965	Shaw, Market Specialist, Functional Fluids, Monsanto to Frito Lay re:	PCB-ARCH0250690
280	6/25/1965	William Hunt, General Offices, St. L. to File "Aroclor 5460"	PCB-ARCH0069588
281	7/1/1965	Ltr from Emmet Kelly to I.M. Singer, E. I. DuPont re: Toxicity and safe handling information on our fire resistant hydraulic fluid, Pydraul 150	STLCOPCB4005133
282	9/3/1965	Letter from Elmer P. Wheeler to Richard Davis re Aroclor 1242 Reliance Electric & Engineering Company, Cleveland, dated September 3, 1965	MONS 097873
283	11/3/1965	Monsanto Receiving Report from Malone Freight Lines received by T.C. Beard Steel Drum Dykanol (drum link in route)	PCB-ARCH0318055
284	11/9/1965	Ltr from H.L. Gray to H.L. Phillips re: Shipment arrived at Lyndhurst, New York containing a leaking drum from a 4 inch slit	PCB-ARCH0318054
285	3/1/1966	Monsanto Aroclor for Capacitors	MONS 078556
286	3/29/1966	Letter from T. Denton-Roberts to D. V. N. Hardy (London) re Turn right Controls - Aroclor 1248 - Handling, dated March 29, 1966	MONS 097926
287	4/4/1966	Letter from Elmer P. Wheeler from John Versack, Boeing Co. re: forwarding the summary of toxicity safe handling information for hydraulic fluid, Pydraul F-9	WATER_PCB-SPO00000407
288	4/15/1966	Ltr from Alvin W. Crow, U.S. Naval Station to Monsanto Chemical Corporation re: Crew worked on three 2400-208 transformers correcting some leaks at the secondary lead busings	MONS090439
289	5/1/1966	World Wide Strategy Capacitor-Dielectric Aroclor Bulletin	LEXOLDMON006614
290	5/10/1966	Memo from WK E. Ault to H.L. Gray re: Therminol FR-2 - Drums; Unacceptable Containers	PCB-ARCH0386327
291	5/24/1966	Call report from Lever Brothers Company to G.R. Buchanan re: Consultation on problems which have developed relating to their Therminol system in Baltimore	PCB-ARCH0250980
292	6/15/1966	A Total Product Strategy Transformer Askarel Document, Revision #3, Replaces Strategy date 6/15/1965	PCB-ARCH0054133
293	7/18/1966	Ltr from Roush to Wheeler re: call regards to toxic aspects of Therminol FR-2 vapors	MONS 096887
294	9/1/1966	A Final Report - Investigation of Certain Pesticide-Wildlife Relationships in the Choccolocco Creek Drainage (Sept. 1, 1966 - Aug. 31, 1967)	TOWOLDMON0054663
295	9/1/1966	PCB Study from University of Stockholm	TRAN 056973
296	9/13/1966	Division totals: Liquid Aroclors, 5 Yr. forecast (in thousands of Lbs.) 1967 - 70,239; 1968 74,449; 1969 79,363; 1970 83,548	PCB-ARCH0125992
297	9/20/1966	Monsanto Complaint Investigation Log; No. S-79-K-66 to W.E. Ault-Wault re: Unacceptable Containers - Three drums have been examined and all show failure due to metal fatigue.	WATER_PCB-SPO00000230
298	9/23/1966	Memo from S. Shaw to G.R. Buchanan/R. Davis re: Trip Report Aug. 29 - Sept. 1 New York District	PCB-ARCH0046759

Exhibit Number	Doc Date	Description	Beg Bates
299	10/3/1966	Telegram P. Gatens and D. T. Mayer re: "Customer [Pierce and Stevens Chemical Company, Buffalo, NY] has complained relative to the failure of several of the drums in this shipment	PCB-ARCH0196575
300	10/5/1966	MSU letter to Monsanto re - water, mud and fish samples Ferguson letter to Fuhrmeister, dated 10/5/66	DSW 162355
301	10/11/1966	Bill of Lading: [handwritten] "Drum leaking ... tape over leak."	PCB-ARCH0212957
302	10/13/1966	Therminol Heat Transfer Food Industry Penetration document	MONS 037782
303	10/20/1966	Monsanto Outgoing Message from Don Pogue - Los Angeles to D. Roush St Louis re: Sample of FRZ from Fritolay on the way. Suspected contamination due to leaking heat exchanger	DSW 434990
304	10/24/1966	Ltr from Richard Davis to G.R. Buchanan, National Tea Company the Food Industry re: Therminol sales	STLCOPCB4096628
305	10/31/1966	Aroclor Plasticizers O/PL-306, October 1966	PCB-ARCH0216396
306	11/2/1966	MSU letter to Monsanto re - October Findings - Caging Experiments	DSW 162358
307	11/28/1966	Letter from Henry Strand to Monsanto Europe, David Wood re: Aroclors (Soren Jensen)	MONS 090520
308	12/1/1966	Monsanto Europe Brussels letter to G.R. Buchanan, Monsanto US re- Aroclor Sweden	MON-MT-008548
309	12/12/1966	Letter from Emmet Kelly to D. Wood - Aroclor Sweden; cc: Arpino, Buchanan, Hardy, Steenrod	NEV 023924
310	12/15/1966	Report of a New Chemical Hazard	MONSFOX00003427
311	12/27/1966	Letter to Mr. Bruce Bradbear from P.G. Benignus re: A Swedish publication newspaper article referring to Polychlorinated Pi-Phenols and not Polychlorinated Biphenyls	HARTOLDMON0000794
312	12/29/1966	Letter from University of Stockholm to Ford, Monsanto Re - PCB Study	MONS 089196
313	1/12/1967	Aroclor - Sweden - Memo from Hardy to Benignus, Buchanan, Cameron, Kelly, Graham, Steenrod, Wood, Evans, Barter	MONS 097068
314	1/26/1967	Letter from D. Wood to G. R. Buchanan - St. Louis re: Sweden, Aroclor	MONS 098136
315	2/2/1967	Ltr from Hardy to Border Chemicals Ltd. Or the attention of Mr. Fuller RE: the safe handling & toxicology of Monsanto Aroclors I	MONS 090529
316	2/10/1967	Letter from R. Emmet Kelly, M. D. to Mr. D. Wood (London), February 10, 1967	MONS 097918
317	2/13/1967	Letter from Gene Wilde (General Offices, Monsanto) to R. Kelly, M. D., dated February 13, 1967	MONS 097089
318	2/21/1967	Letter from D. V. N. Hardy to Dr. R. Kelly (St. Louis) re Sweden, Aroclor	MONS 096494
319	2/21/1967	Monsanto letter RE - how to deal with Swedish PCB study Kelly to Gene Wilde	MONS 096495
320	2/22/1967	Letter from D. Wood to E. Kelly re: Soren Jensen's, original papers in English	TOWOLDMON0003200
321	2/27/1967	Letter from Dr. R. Emmet Kelly to Dr. M.J. Thomas of NCR attaching a photostat of paper by Dr. Jensen's of Sweden's original paperwork relating to PCBs	HARTOLDMON0000798
322	2/27/1967	Letter from D. Wood to D.V.N. Hardy re: GB small samples of various isomers of Aroclor	MON-MT-008561
323	2/27/1967	Letter from R. Emmet Kelly, M. D. to Mr. Dave Wood	MONS 097694
324	3/16/1967	Gene Wilde to Kelly re: In contact with Widmark and following this. Chemical engineering had a story about Sweden and PCBs	PCB-ARCH0289728
325	4/20/1967	Memo from J.G. Bryant to R.G. Moody re: Split Chime on Aroclor Drum	PCB-ARCH0291997
326	5/22/1967	Ltr from S. Shaw to Clinton C. Boushell re: Therminol for food application	PCB-ARCH0579082
327	7/11/1967	Industrial Bio-Test Laboratories, Inc. Report to Monsanto Company 21-	PCB-ARCH0069732

Exhibit Number	Doc Date	Description	Beg Bates
328	8/1/1967	Monsanto's Here's How to Get More Performance and Save Money When Specifying Transformers book	TOWOLDMON0035698
329	9/1/1967	Memo from M. Schuitema to V.J. Heroufousse re: complaints from Piet Smith that some of their workers go skin irritations when handling Sontotherm	MONS097949
330	9/7/1967	Anniston - Increase Aroclor Capacity Expansion Plan	TOWOLDMON0043842
331	9/9/1967	Aroclor Dept. 246 welcome letter	STLCOPCB4044374
332	9/13/1967	Memo from W.E. Gordon to K.L. Gray re: Inerteen	PCB-ARCH0386292
333	10/21/1967	Chlorinated Hydrocarbons in British Wildlife by D.C. Homes, J.H. Simmons, J. O'G Tatton Laboratory of the Government Chemist, London	MONS 083030
334	11/1/1967	Letter from Jack T. Garratt to H. Wilbur Speicher re: Letter from Jack T. Garratt to H. Wilbur Speicher re: Inerteen warning labels for any	NEV 011709
335	11/2/1967	Letter from A. Richardson (Shell Chemicals) to Dr. V. N. Hardy (Monsanto)	MONS 091211
336	11/3/1967	Letter from D.V. H. Hardy to Mr. Richardson, Shell Chemicals	TOWOLDMON0054632
337	11/6/1967	Letter from Dick Hamil (Atlanta) to Stan Shaw (St. Louis): Frito Lay Boiler Accident, Monday, October 30, 1967	MONS 097765
338	11/7/1967	Ltr from Don Roush to T.C. White, Shurtenda Steaks re: Therminol Sample	STLCOPCB4096647
339	11/15/1967	Letter from Gene Wilde to Emmet Kelly re: Adverse publicity in Europe on chlorinated hydrocarbons & article regarding polychlorinated compounds detected in British wildlife from Mr. Hardy	MONS 097067
340	11/16/1967	Letter from Dr. R. E. Kelly to Gene Wilde	MONS 096492
341	11/22/1967	Meeting of the Board of Directors - expansion of aroclor facilities	TOWOLDMON0054630
342	11/29/1967	Progress Report Title: Aroclor and Aroclor Blends: Process Improvement Plan by R.M. McCuthchan (J.W. Molloy)	PCB-ARCH0207819
343	12/21/1967	Ltr from William H. Hunt to R.M. Parks re: Aroclor 5460 Egg Hatchability and Chick Viability	PCB-ARCH0069746
344	12/30/1967	Organochlorine Pesticides in Seals and Porpoises by A.V. Holden; K. Marsden; Nature Vol. 216	WATER_PCB-00054579
345	1/1/1968	1968 Handwritten Aroclor Usage by State & Map	STLCOPCB4052347
346	1/1/1968	2nd Quarter 1968 "the Word on Aroclor, Issue No. 2.	TOWOLDMON0057300
347	1/1/1968	Organic Chemical Division 1968 Ed. Philosophy of the 1968 Reorganization	WATER_PCB-SD0000087441
348	1/8/1968	S. A. Heininger, St.L. to C.E. Anagnostopoulos [Functional fluids] and Robson re: studies to be undertaken by WARF on identification of 'chlorinated hydrocarbons' residues in gulls and various shore bird species	TOWOLDMON 0003775
349	2/20/1968	Work Proposal: WGK Plant" Aroclor/Blends, Fume Removal System re: Statement of Problem: Aroclor, biphenyl and HCl fumes are irritating and must be removed from the work area. Personnel are exposed when	PCB-ARCH 0133986
350	2/23/1968	Memo from D.V.N. Hardy to W.R. Richard re: Aroclors	PCB-ARCH0577266
351	3/15/1968	Pesticides: Transatlantic Movements in the Northeast Trades Cience Vol. 159	MONS 087284
352	3/18/1968	W.J. Gissendanner, Organic Chemicals Division to L.A. Owen re: letter to confirm the toxicological data for our Aroclors 1254 and 5460	PCB-ARCH0069611
353	3/26/1968	Letter from Don Roush (St. Louis, General Offices) to D. Wood (Brussels): Therminol/Santotherm Contamination of Cooking Oil - Smith Potato Crisps, Holland	MONS 097447
354	4/1/1968	The Word on Aroclor Issue No. 1, 1st Qtr. 1968 by Virgil & Harry	DSW 248373
355	4/4/1968	Document titled "Parlon Promotion Means Aroclor Opportunities"	DSW 592513

Exhibit Number	Doc Date	Description	Beg Bates
356	4/22/1968	Minutes of Meeting of the Corporate Development Committee - Present C. H. Sommer - Chairman, E. J. Bock, J. L. Christian, J. L. Gillis, R. K. Mueller, E. A. O'Neal, M. C. Throdahl, R. K. Fliteraft - Secretary	TOWOLDMON0001287
357	4/28/1968	Letter from R. Emmett Kelly to Dave Fritz, Kaiser Aluminum, Trentwood Works re: Forwarded toxicity and safe handling information on fire resistant hydraulic fluid, Pydraul 312	WATER_PCB-SPO00000397
358	5/6/1968	Letter from R. Emmet Kelly to C. E. Anagnostopoulos and E. S. Robson re Aroclor residues in Fish and Fowl	MONS 097072
359	5/20/1968	Letter from W. R. Richard (Research Center) to R. Davis	MONS 097071
360	5/23/1968	Letter from Richard Davis to W.R. Richard re: Aroclor into sewers and streams from Industrial fluids applications is in industrial hydraulics	WATER_PCB-SD0000043410
361	6/5/1968	Letter from Emmet Kelly to Wayne Thornburg re: Subacute oral toxicity on chlorinated biphenyls & Aroclor 5460 carried out on chickens along with unpublished data on 20 Day subacute dermal toxicity to Rabbits	MONS 087907
362	6/18/1968	US Bureau of Commercial Fisheries - Aroclors	MONS 097094
363	6/26/1968	A Monsanto Business in Fluid Heat Transfer Systems Functional Fluids Business Group	PCB-ARCH0005606
364	7/31/1968	Memo from C. Paton to Richard, Kelly, Wheeler, Keller re: "New Scientist" article from Dec. 15, 1966 Article on PCB Aroclor toxicity	TOWOLDMON0046260
365	9/9/1968	Otis Fancher, IBT to Wheeler re: Letter including protocols for studies of Aroclors, including 2 year chronic Toxicity studies.	MONS091215
366	9/10/1968	Memo from R.W. Ehrhardt to W.E. Gordon re: Bridgeport, Connecticut Aroclor 1242 - Electrical Grade	PCB-ARCH0377679
367	9/12/1968	Ltr from William F. Randolph to Dr. R. Emmet Kelly re: Food Additive Petition No. 8B2306	PCB-ARCH0015469
368	9/20/1968	Receiving Report from Maline Freight Lines, Inc. to J.H. Powell re: Returned drums leaking Aroclor 1254	PCB-ARCH0294474
369	9/25/1968	Memo from Meeting Committee S. Shaw, R. Meyer, R. Steenrod, L. Bradford re: Aroclor - Long Range Objectives Marketing Plan	WATER_PCB-SD0000079981
370	10/1/1968	Japanese PCB - 1000 sickened.	
371	10/9/1968	Professor R. W. Risebrough's Pre-publication: Chlorinated Hydrocarbons In Marine Ecosystems,"	MONS 083014
372	10/14/1968	H. L. Williams, Anniston to W. A. Kuhn, St. L "Aroclor Complaints" Item 4 - leakage ... Aroclor 1242 Westinghouse - Bloomington.... Car damaged by railroad in transit."	PCB-ARCH0377086
373	10/16/1968	Ltr from W.A. Kuhn to W.B. Papageorge re: Fluids Group business objective for 1969	PCB-ARCH0207618
374	10/21/1968	Polychlorinated Biphenyls in the Environment - Letter from Wheeler to Richard; cc: Kelly, Tucker, Keller, Payton, Bergen, Johnson	MONS 097123
375	11/26/1968	Call Report - Organic Division Marketing Department: Customer Al Olney; To: Norm Johnson; re: Follow-up on impending Therminol Systems with Jersey Maid	WATER_PCB-SD0000078379
376	12/4/1968	Letter from D. A. Olson to W. R. Richard: Aroclor Toxicity	MONS 096341
377	12/6/1968	Memo from L.D. Press to file re: Plasticizer call report Kimberly - Clark 12/4/1968	MONS 080382
378	12/9/1968	Ltr from W.R. Richard to Ralph Munch re: Defense of Aroclor	MONS 097304
379	12/9/1968	Ltr from Kazuo Hoshino to D.A. Olson re: Bran Oil Poisoning by Kaneclor	STLCOPCB4039495
380	12/10/1968	James H Schuch to File, re: Aroclor 4465	MONS 096767

Exhibit Number	Doc Date	Description	Beg Bates
381	12/14/1968	Article by Risebrough, <u>Nature</u> , vol. 220, 12/14/68 titled "Polychlorinated Biphenyls in the Global Ecosystem"	DSW 280820
382	12/20/1968	Letter from E. P. Wheeler to Dr. Joseph C. Calandra, Industrial Bio-Test Laboratories, Inc.	MONS100163
383	12/30/1968	Aroclor - Wildlife - to: Kuhn from Richard (Research Center) cc: Bergen, Hodges, Wheeler, Tucker, Olson, Kounts, Davis, Johnson	MONS 097307
384	1/1/1969	Clinical Toxicology of Commercial Products Acute Poisoning Marion N. Gleason, Robert E. Gosselin, Harold C. Hodge, Roger P. Smith	PCB-ARCH0305786
385	1/3/1969	Memo from D.E. Roush re: Therminol FR System Experience and Design Considerations for Food Applications	DSW 201202
386	1/14/1969	Letter from D. A. Olson to Kazuo Hoshino MMK, Tokyo re: Aroclor Toxicity	MONS 096369
387	1/17/1969	Memo from W.R. Richard to W. Kuhn re: Krummrich toxic dump was	PCB-ARCH0303696
388	1/23/1969	Monsanto Memo - Aroclors in Plant Effluent	DSW 014282
389	1/30/1969	Memo from O.N. Mueth to Mr. Elmo Campbell re: Recent Drum Failures	PCB-ARCH0195758
390	1/30/1969	Call Report, Organic Division, National Can Co., Danbury, CT re: "They	
391	2/14/1969	Monsanto Memo - Inquiry from vapor corporation on toxic effect of chlorinated biphenyl	MONS 096865
392	2/18/1969	Monsanto Memo - Tokyo	MONS 097691
393	2/19/1969	Tom C. Ford to Walter E. Schalk re: Proposed response to SF Ch. Art.	PCB-ARCH0052948
394	2/24/1969	Progress Report - Waste Audits	DSW 014277
395	2/24/1969	Articles from S. F. Chronicle titled "A Menacing New Pollutant" and "Bay Scientist's Pollutant Warning".	MONS 030310
396	2/25/1969	Monsanto Memo - Aroclor Wildlife Tucker to Richard and Wheeler	MONS 097108
397	2/26/1969	Letter from E. Scott Tucker to L. R. Stark (General Offices) re Aroclor Water Solubility	MONS 098149
398	2/27/1969	Letter from Jack T. Garrett re Aroclors - San Francisco Bay Regional Water Quality Board, Aroclor - Wildlife File	MONS 096366
399	2/27/1969	Draft Memo and Answers to Press Inquiries;	MONS 097609
400	2/28/1969	Monsanto Statement, draft	MONS 087893
401	2/28/1969	R.E. Keller to Richard re: Rough Draft of response.	PCB-ARCH0289331
402	2/28/1969	H.L. Minkler to Mrs. Sidney DeGoff, San Francisco re: Mr. E.J. Bock, President of Monsanto, has asked that I, as division manager responsible for the marketing and manufacture of Aroclor, respond to your note of February 24th regarding the article about our product which appeared on February 24 in the San Francisco Chronicle." Attaches "our comments which we are releasing for public and trade use."	STLCOPCB4052554
403	3/1/1969	Report, Applied Sciences Section Functional Fluids: Aroclor Environmental Studies	MONS035992
404	3/3/1969	Functional Fluids Group sent letter to 31 major Aroclor Customers in transformers and capacitor applications	MCL000001
405	3/3/1969	Letter from Tom C. Ford to Mr. Harry M. Bennett (Sherman Oaks) and Mr. Linton von Beroldingen (San Francisco) (response to menacing new pollutant)2	MONS 097499
406	3/3/1969	Statement from Monsanto Company re Feb. 24 San Francisco Chronicle article.	No Bates
407	3/3/1969	Question and Answer Sheet on Polychlorinated Biphenyl	PCB-ARCH0000256
408	3/4/1969	Letter from E. S. Tucker to W. R. Richard: Aroclor - Wildlife: Incineration of NCR Paper	MONS 097053
409	3/6/1969	Letter from W. R. Richards to E. Wheeler re - Aroclor Wildlife Accusations	MONS 096509; MONS 097232
410	3/6/1969	Letter from Tom C. Ford to Mr. H. H. Bible, Mr. E. J. Bock, Mr. J. L.	MONS 097978

Exhibit Number	Doc Date	Description	Beg Bates
411	3/7/1969	Memo from WR Richard to file copying Scott Tucker and Dr. Keller, Wheeler and Kelly.	LEXOLDMON000639
412	3/10/1969	Monsanto Memo - Industrial Bio-test lab, Aroclor - Wildlife	MONS 097709
413	3/11/1969	Forrestal to Bergen letter re Polychlorinated Biphenyls, date 3/11/69	DSW 583754
414	3/12/1969	March 12, 1969 Waychoff letter to Schalk, attaching March 12, 1969 Paton letter to Schalk	DSW 593169
415	3/12/1969	Paton letter to Waychoff, re Future Plans for Aroclor Plasticizers, dated 3/12/69	DSW 593170
416	3/13/1969	Ford letter to Arbogast dated 3/13/69	DSW 282057
417	3/18/1969	Letter from Elmer P. Wheeler to Tom Ford re Monsanto's Statement on PCB's in Wildlife	MONS 097606
418	3/21/1969	Ford letter to Trimegistus	DSW 201071
419	3/21/1969	4/2/1969 Document titled "Report And Comments on Meeting on Chlorinated Biphenyls in the Environment" at Industrial Biotech Laboratories, Chicago, March 21, 1969 by Robert L. Metcalf	NEV 027182
420	3/24/1969	Letter from Jack T. Barrett (Pollution Abatement and Industrial Hygiene) to Harry Chatfield (Los Angeles County Air Pollution), BCC: Richard, Tom Ford, Bergen, Springgate	MONS 090790
421	3/27/1969	Bergen letter to Dierker San Francisco RWQCB, dated 3/27/69 re: response to questions concerning PCBs manufactured by Monsanto	DSW 280813
422	4/2/1969	Report and comments on meeting on chlorinated biphenyls, Robert L. Metcalf	MONS 037565
423	4/8/1969	Wheeler letter to Richards re Aroclor Degradation in Soil, dated 4/8/69	TRAN 008733
424	4/14/1969	Monsanto Memo - Disposal and incineration of aroclor	MONS 100160
425	4/15/1969	Letter from E. P. Wheeler to Dr. Joseph Calandra, Industrial Bio-Test Laboratories, Inc. re: Toxicity Studies on Aroclors	MONS 089170
426	4/16/1969	Memo from E.P. Wheeler to R.E. Soden re: Polychlorinated Biphenyls in the Environment	HARTOLDMON0007982
427	4/18/1969	Plasticizer Sales Call Report - Cumming Paton	MONS 080267
428	4/28/1969	Minutes of Corporate Development Committee meeting	TOWOLDMON0001312
429	5/1/1969	Memo from A. F. Pier to R. M. Kountz re Disposal of Chlorinated Wastes.	DSW 013493
430	5/6/1969	"Aroclor Toxicity Mtg" handwritten -- attendees: Wheeler, Kelly, Keller,	
431	5/12/1969	Monsanto Memo - Aroclor Clean-up from Plant Effluent	DSW 013488
432	5/19/1969	Letter from Elmer Wheeler to Dr. Goldberg re - safe usage of two of Monsanto's aroclors	NCR-FOX-0575886
433	5/22/1969	Meeting of the Board of Directors	DSW 128951
434	5/23/1969	Memo from Randall Graham to J.R. Fallon re: Red Tag Maintenance Program/Electrolux	PCB-ARCH0062369
435	5/26/1969	Letter from Elmer P. Wheeler to W. R. Richard - Incineration of Aroclor	MONS 096344
436	5/28/1969	Ford letter to the Gainesville Sun dated 3/28/69	DSW 200973
437	6/5/1969	Monsanto Chemicals Limited Product Toxicology - Aroclors by D.V.N. Hardy Report summarizing present knowledge concerning chlorine-containing residues in wild life and visits made to organization implicated therewith during the period April 28th - May 1st, 1969	PCB-ARCH0288855
438	6/10/1969	Springgate letter to Schalk dated 6/10/69	MONS 097841
439	6/12/1969	R.E. Keller rough draft notes from part of European trip	MONS 034748
440	6/12/1969	Letter from Elmer P. Wheeler to Dr. Robert E. Keller re Report on "Human Poisoning with Kane-Chlor"	MONS 086881

Exhibit Number	Doc Date	Description	Beg Bates
441	6/13/1969	Ltr from Tom C. Ford to Mr. Robert A. Hoving re: Alleged effect on the environment of PCB	MONS 087840
442	6/13/1969	Letter from Tom C. Ford Manager of Divisional Public Relations of Monsanto to Mr. Phillip Yaffee, Wall Street Journal	MONS 090761
443	6/18/1969	Memo from Cumming Paton to J.E. Springgate re: Aroclor 5460	PCB-ARCH0176854
444	6/24/1969	Tucker to Keller, "Monthly Summary - Aroclor Wildlife" Aroclor Degradation in Soil	MONS 097041
445	7/1/1969	Document titled "Quarterly Report", July, August, September 1969	MONS 036714
446	7/1/1969	Document titled "The Death of Aroclor"	MONS 045497
447	7/1/1969	Technical Bulletin No. O/PL-311A, Aroclor resins and plasticizers for chlorinated rubber, date stamped March 24, 1974	TOWOLDMON0035244
448	7/15/1969	Letter from Elmer P. Wheeler to John Teasley regarding requested Aroclor information	GPFOX00045446
449	7/17/1969	Monsanto Memo - Queeny Plant	DSW 006369
450	7/23/1969	Letter to Bruce Pyle (Department of Conservation and Economic Development from Elmer P. Wheeler (Environmental Health)	MONS 090798
451	7/24/1969	Memo from J.G. Bryant to H.S. Bergen re: Scrap Aroclor Disposal	PCB-ARCH0073232
452	8/1/1969	Ingersoll B. DDT on trial in Wisconsin-part II. Bioscience. 19 (Aug 1969), 735-736	
453	8/5/1969	Letter from Jack T. Garrett (Medical Department) to Dr. E. S. Tucker	MONS 097464
454	8/15/1969	Letter from Elmer P. Wheeler to J. R. Fallon re Therminol FR Series -- Chlorinated Biphenyls Food Processing	MONS 097763
455	8/20/1969	Memo from B.O. Severson to H.L. Williams re: Toxicity Warning Label - Aroclor	PCB-ARCH0025028
456	8/25/1969	PCB Committee Meeting Notes	DSW 164930
457	8/25/1969	Letter from E.V. John to Martin W. Farrar, Paul B Hodges, Williams R. Richards, Elmer P. Wheeler re: Task Force appointed by the PCB committee	MON-MT-003319
458	8/26/1969	Letter from Jack T. Garrett to Elmer P. Wheeler	MONS 097989
459	9/1/1969	Index - Sources of Scrap Electrical Aroclor Disposal Reclamation of Aroclors for Use in Industrial Fluids; Bulk Versus Drum Shipments	PCB-ARCH0059484
460	9/5/1969	Cumming Paton to H.E. Smith "Aroclor 5460 Quality" There are 3 apparent problems with Aroclor 5460 that are disturbing in view of our hopes of getting it FDA approved.	PCB-ARCH0014207
461	9/5/1969	Minutes of Aroclor "Ad Hoc" Committee - First Meeting Farrar, Hodges, John, Richard, Wheeler	STLCOPCB4024915
462	9/9/1969	Defense of Aroclor - F. Fluids - from W. R. Richard to E. Wheeler	DSW 014256
463	9/11/1969	Ltr from H.M. Frankton, Monsanto Limited re: Pyroclor - a recent incident where men handling Pyroclor in link boxes of sealed transformers suffered some ill effects such as skin irritation and sickness	PCB-ARCH0577507
464	9/12/1969	Memo from Bergen to Kuhn, with attached memo dated 9/9/1969 from Richards to Wheeler re: Defense of Aroclor- F.. Fluids	MONS 097283
465	9/16/1969	Ltr from W.A. Kuhn to H.S. Bergen & W.R. Richard re: Defense of Aroclor	STLCOPCB4052824
466	9/19/1969	Letter from W. A. Kuhn (St. Louis) to H. S. Bergen	MONS 096384
467	9/23/1969	Kuhn to H.L. Williams - Anniston "Unsalable Finished Goods Inventory"	PCB-ARCH0014196
468	9/25/1969	Letter from E. S. Tucker to R. E. Keller re Wisconsin Alumni Research Foundation Institute Trip Report - September 24, 1969	MONS 071163

Exhibit Number	Doc Date	Description	Beg Bates
469	9/29/1969	Memo from W.R. Krummrich Plant to Mr. W.A. Kuhn re: Current Size of Aroclor Sewer Losses; Proposal to Reduce Losses	PCB- ARCH0302427
470	10/2/1969	Report of Aroclor "Ad Hoc" Committee - from Farrar, Hodges, John, Richard, Wheeler to Howard S. Bergen and James Springate	TOWOLDMON0047671
471	10/6/1969	Memo from W.A. Kuhn to R.M. McCutchan re: Recovery of Aroclor Loses	STLCOPCB4057922
472	10/9/1969	Monsanto Memo - Status report aroclors clean-up of the plant effluents	MONS 049095
473	10/9/1969	C.F. Buckley, Krummrich Plant to T. W. Walton, "Pyranol in Transformers"	PCB-ARCH0302419
474	10/10/1969	Memo from Elmer P. Wheeler to E. J. Bock re Background for	TRAN 058839
475	10/13/1969	Call Report, Jiffy Fry Foods, Crookston, Minn re: Report of "leaks were found in each of the four coils" need test for contamination.	PCB-ARCH0250867
476	10/15/1969	Report of Aroclor "Ad Hoc" Committee second draft	DSW 164905
477	10/17/1969	Ltr from H.A.F. Allison, Mill Haven Fibers Ltd. to T.W. Oneson, Monsanto Canada	MONS 089406
478	10/22/1969	Letter from H. S. Bergen (St. Louis) to Dr. R. S. Gordon re Aroclors - PCB - Washington Conference on Food Nutrition and Health	MONS 096389
479	10/27/1969	Call Report, Organic Division Marketing Department, Johnson and Johnson, New Brunswick, NJ "Started "manufacturing a new disposal paper product for hospital use. The system utilizing Therminol FR-1 developed severe leakage and the resultant fumes caused a labor walk out and shut down of the plant."	MONS 072120
480	10/29/1969	"Executive Summary PCB Pollution" Problem, dated 10/29/69 with attachment	MONS 034081
481	10/29/1969	Statement from Monsanto Company, St. Louis, MO	MONS 060342
482	10/30/1969	Executive Summary PCB Pollution Bergen to C. J. Smith and T. K. Smith - attachments	LEXOLDMON000161
483	10/30/1969	Letter from HN Dahlstrom (Brussels) to Distribution List cc: JJ Spano re: Toxicity of Chlorinated Diphenyls October 30, 1969.	MONS 096387
484	11/3/1969	"Call Report, Organic Division Marketing Department, Johnson and Johnson, New Brunswick, NJ" re: "The purpose of this call was to follow the previous weeks activities with Johnson & Johnson relating to the difficulties and work stoppage that resulted from excessive leaks in their Therminol system."	
485	11/10/1969	E.S. Tucker - Aroclor Wildlife Problem - rough draft	MONS 034612
486	11/10/1969	Outline - PCB Environmental Pollution Abatement Plan - Rough Draft	MONS 035310, PCB-ARCH0240444
487	11/10/1969	PCB Environmental Pollution Abatement Plan	MONS 035372
488	11/14/1969	Monsanto Memo E. G. Wright Anniston to Papageorge - Aroclor Spill on March 6 1969	DSW 014093
489	11/17/1969	Elmer Wheeler's presentation to the CMC	MONS 034245
490	11/17/1969	Minutes of Meeting of the Corporate Development Committee - unredacted, contains warning language	TOWOLDMON0051139
491	11/17/1969	PCB Presentation to Corporate Development Committee	TOWOLDMON0052202
492	11/20/1969	Monsanto Memo - Aroclor Spill on Nov 6 1969	DSW 013748
493	11/24/1969	Memo from Ehlers, dated November 24, 1969, with copy of the minutes of the Corporate Development Committee meeting of 11-17-69	MONS 097556

Exhibit Number	Doc Date	Description	Beg Bates
494	11/26/1969	Paton to ?, "NCR/Aroclor 1242 Replacements" re: discussed NCR with Pete Maier today. 1. Monsanto Plasticizer Line. In March/April we submitted 22 standard plasticizers to NCR for evaluation. They were all esters with the exception of HB-40 and represented each of the ester classes we produce. They were all turned down by NCR on the basis of 'no color development'. In the case of DMP and HB-40 this conflicts with the data developed by Kern. ... Pete will try to get more specific answers as to why our standard plasticizers failed and will also try to get us PVMMA resin for our needs."	MONS 097975
495	12/1/1969	Possible Press Queries Resulting from Anticipated Lawsuit by Southeast Fisheries Association, Inc. Against Monsanto (Pensacola Plant)	PCB-ARCH0621022
496	12/3/1969	Letter from E. S. Tucker to C. Paton and J. T. Garrett re Aroclor-Wildlife, NCR Water Samples	MONS 096522
497	12/5/1969	Future Positions - Dielectrics (1)	MONS 096339
498	12/5/1969	Letter from P. G. Benignus to D. A. Olson re PCB Toxicity Problem, Proper Disposal of Scrap Aroclor	MONS 100159
499	12/8/1969	Aroclor Waste Disposal	MONS 100155
500	12/11/1969	Progress Report Job No. 91341:4119 Personnel M. Pierle (C.F. Buckley) Title: Water Pollution: Aroclor Control Problem: Report status of measurement and control work	PCB-ARCH0105436
501	12/12/1969	Ltr to Kevin P. Shea, Environment Magazine re: planned Jan. 1970 publication on "environmental contamination by polychlorinated biphenyls (PCBs)	PCB-ARCH0176900
502	12/15/1969	Letter from Edward V. John to Kevin P. Shea re paper to be published re environmental contamination by PCBs.	M13521
503	12/15/1969	Letter from Jack T. Garrett (Manager, Industrial Hygiene) to Mr. Newton E. Whitman, Homer Research Laboratories	MONS 087832
504	12/15/1969	Letter from Jack T. Garrett (Manager, Industrial Hygiene) to Mr. Newton E. Whitman, Homer Research Laboratories	MONS 087832
505	12/16/1969	Letter from Jack T. Garrett to Howard S. Bergen	MONS 096520
506	12/16/1969	Memo from Jack t. Garrett re: Therminol FR-2 File	MONS 099933
507	1/1/1970	Dept 246 Operation Report Aroclors 1969	PCB-ARCH0123779
508	1/4/1970	Transcript of Elmer Wheeler's Comments on Soundings - Broadcast over Canadian Broadcasting Company Week of January 4, 1970	PCB-ARCH0000384
509	1/13/1970	Aroclor Effluent - Visit to NCR	MONS 056715
510	1/15/1970	Memo from D.E. Roush to John Heilala re: Leak in the back coil on their 3-coil Vapower Therminol heater	PCB-ARCH0483868
511	1/21/1970	The PCB-Pollution Problem Summary of January 21 and 22, 1970 St. Louis Meeting with General Electric Company	PCB-ARCH0290212
512	1/23/1970	Memo from H.S. Bergen to W.B. Papageorge re: Sanitary Lands Fills or Toxic Dumps for PCB	PCB-ARCH0054443
513	1/26/1970	The PCB-Pollution Problem, St. Louis Meeting with General Electric Co., January 21-22, 1970	PCB-ARCH0064836
514	1/28/1970	Call Report, Organic Division, Lever Bros., Inc., Los Angeles, CA re: At several points during the meeting, there was further evidence, particularly by Maintenance people, that such contamination of the Therminol had occurred. In one instance, it was reported that Therminol was seen pouring from one of the process pumps. Although the pump was tested for leaks, and none were found, it is obvious that Therminol was finding its way into the product and vice versa."	PCB-ARCH0250928

Exhibit Number	Doc Date	Description	Beg Bates
515	1/29/1970	Letter from Elmer P. Wheeler to D.S. Cameron, Barrett, Papageorge re Status of Aroclor Toxicological studies	MONS 098480
516	2/2/1970	The Transformer Askarel Fluid Market by Donald R. Pogue	LEXOLD MON006496
517	2/9/1970	Letter from Donald A. Olson to customers re: warning them of newspaper and magazine articles stating PCBs have been discovered in marine, aquatic and wildlife environment	MCL000005
518	2/9/1970	Minutes of the Technical Meeting of the B.I.T./Askarels Frankfurt 9th Feb. 1970	PCB-ARCH-EXT0013623
519	2/12/1970	Memo from Papageorge to E. P. Wheeler re PCB Levels - Plant Effluent.	DSW 013214
520	2/16/1970	Patton letter Re: "PCB Publicity" dated 2/16/70	DSW 318222.55
521	2/16/1970	Handwritten letter Re "PCB Publicity"	DSW 318257
522	2/16/1970	Pollution Letter - from N.T. Johnson Monsanto approved talking points and tips regarding customer discussions	MONS 100123
523	2/16/1970	Memo from P.G. Benignus to E.P. Wheeler re: Transformer Askarels Calls in the San Francisco Area	PCB-ARCH0544802
524	2/16/1970	Presentation to Field Sales - Personal and Confidential, 1970	TOWOLDMON0046386
525	2/18/1970	Letter from Donald A. Olson to all fluids customers	MCL000094
526	2/19/1970	Schalk letter (undated) with attachment	DSW 318245
527	2/19/1970	Mitsubishi Monsanto Chemical Co., Tokyo to Bergen, St. Louis, "Aroclor Export" "MMK appreciates the action already underway which may lead to exports to India. We are hopeful that other business can also be obtained."	PCB-ARCH0053354
528	2/19/1970	Ltr from W.E. Schalk to Mr. C.J. Turriff re: articles published indicating PCBs have been discovered in some marine aquatic and wildlife	PCB-ARCH0299469
529	2/27/1970	Monsanto letter to direct customers with attachment and client list (plasticizer customer list)	MCL000121
530	3/1/1970	Document titled "Extraction Of Aroclor 1254 From Painted Surfaces By Water" dated March 1970	MONS 068229
531	3/1/1970	Monsanto Technical Bulletin O/PL-306A, Aroclor Plasticizers, 1970	TOWOLDMON0020776
532	3/1/1970	Organic Div, Law and Med. Depts, "Report on Polychlorinated Biphenyls" Conclusion: In light of environmental damage, "we should plan to discontinue the manufacture of A 1254 and 1260. The Div is instructed to develop a program to discontinue these products and report this to the Committee."	
533	3/2/1970	Letter from A. F. Pier to W. B. Papageorge re CEA 8042 - Waste Aroclor Disposal	DSW 187789
534	3/2/1970	Customer Notification Letter on PCBs in response to Plasticizer Group mailing - Cumming Paton to Park & Papageorge (customer list)	MCL000129
535	3/4/1970	Monsanto Letter from Elmer P. Wheeler to Joseph Calandra	NEV 008441
536	3/6/1970	Letter from Papageorge to Durland - Tokyo regarding Aroclor Environmental Program	MONS 099591
537	3/6/1970	Kelly to Thomas Gibbs, Continental Can Co. re: On Aroclor 5460."Based on the animal toxicity studies and the physical characteristics, it would not appear that the use of this product should introduce any serious hazards. We would recommend as a matter of good practice mechanical exhaust ventilation if the material is to be used at temperatures where it would be molten."	PCB-ARCH 0069629
538	3/10/1970	Document titled "Report Of Meeting with Ministry of Agriculture, Fisheries & Food", dated 3/10/70	MONS 034203

Exhibit Number	Doc Date	Description	Beg Bates
539	3/18/1970	Company Confidential - Manufacturing Improvement Plan for Aroclor Dept. 246 - Approved Jan. 29, 1970	MONS 055697
540	3/18/1970	Memo from Keller to R.A. Lidgett Raubon re: RAL 3/9/70 Memo to Rek	MONS 098460
541	3/18/1970	Call Report from Customer to J.R. Fallan, Salesman J.S. Pullman re: Special therminol FR-I rotating dryer	PCB-ARCH0483278
542	3/23/1970	Letter from W. B. Papageorge to Christine Duncan re concern of environmental contamination by PCBs	PCB-ARCH0000329
543	3/25/1970	Ltr from J.S. Pullman to D.E. Roush re: call from Mrs. Pauls Company regarding coil in their newest fryer to be hooked up in Braddock Heights failed	PCB-ARCH0737324
544	3/26/1970	Ltr from W.E. Schalk to Mr. Charles M. Gore re: Aroclor 1248 present the threat of environmental contamination	PCB-ARCH0484461
545	3/28/1970	Industrial Wastes: Nondegradable Additive," Science News, 97	
546	3/30/1970	Letter from Kelly to Papageorge; cc: Bergen, Minckler, Park, Springgate - Aroclor in Milk	MONS 099541
547	3/31/1970	Patton letter to "Product Group", dated 3/31/70	DSW 318184
548	4/1/1970	Rough Draft - Management Plan Polychlorinated Biphenyl Environmental Problem, Papageorge's Exhibit No. 9, Maertin depo of November 12, 1997	MONS 033834
549	4/1/1970	Handwritten notes of Presentation of the PCB Management Plan, April	MONS 035393
550	4/1/1970	Management Plan Polychlorinated Biphenyl Environmental Problem Final	PCB-ARCH0000292
551	4/2/1970	John Mason to Springgate re: Now says that ok to disclose info to British	PCB-ARCH0054270
552	4/2/1970	Memo from H.S. Bergen to W.B. Papageorge re: PCB - Electrical Customers D.A. Olson's Memo 4/1/1970	PCB-ARCH0054272
553	4/3/1970	Memo from Cumming Paton to Bechtold, Brell, Brydon, Chew, Fording, Fowler, Johnson, McNamara, Onians, Sperberg, Wilde re: Aroclor Bulletin O/PL-306	TOWOLDMON0051983
554	4/7/1970	Memo from W.B. Papageorge to H.S. Bergen, J. Mason, H.L. Minckler, C.J. Smith, T.K. Smith, J.E. Springgate re: Attached Management Plan Polychlorinated Biphenyl Environmental Problem	WATER_PCB-SD0000001340
555	4/7/1970	Wheeler, "CMC Presentation"	
556	4/9/1970	Letter from John Mason to W. B. Papageorge re PCB's Management Plan	MONS 098456
557	4/9/1970	Ltr from William F. Ryan to Mr. Edward J. Bock	PCB-ARCH0060394
558	4/9/1970	Monsanto Call Report Customer Name Oil Base Incorporated to: J.R. Fallon re: 8 Drums of FR 1 while had several small leaks	PCB-ARCH0483131
559	4/9/1970	Call Report from customer Mrs. Paul's Kitchen to J.R. Fallan, Salesman J.S. Paullman re: George Petrillos asking assistance to design a collar for use with three fryers at the Braddock Heights Plant	PCB-ARCH0483181
560	4/10/1970	Statement by Congressman William F. Ryan on A New Environmental Hazard	MONS 058516
561	4/10/1970	Monsanto, "Replies To Charge That PCB Threatens Environment," For Release Immediately, April 10, 1970	MONS 061139
562	4/10/1970	Donald T. Mayer to Arnie Nagel and Ben Williams re: Arnie - as usual, you held situation well!.... However, policy on PCBs is NOT discuss w/any "outside agency," to any degree. - i.e. Question - Our Answer "I'm not familiar with the details," and refer to Buckley.	PCB-ARCH0006730
563	4/11/1970	Curb urged in Use of PCB Chemical; Ryan Asks a Partial Ban on Substance in Pesticides by David Bird, The New York Times Pg. 31, Sect.	MONS 031347
564	4/13/1970	Memo from Cumming Paton to Papageorge re: Document titled "Aroclor Plasticizer Survey", dated 4/13/70	MON-MT-003143

Exhibit Number	Doc Date	Description	Beg Bates
565	4/13/1970	Letter from Kelly to Hayes re: Publications on PCB and their presence in the Ecosystem	MONS 088491
566	4/13/1970	Memo from Papageorge to H.S. Bergen, M.W. Farrar, E.V. John, C. Paton, W.R. Richard, J.R. Savage, J.E. Springgate; E.P. Wheeler; D.A. Olson re: Aroclor Labeling	TOWOLDMON0003409
567	4/15/1970	Outline - CMC Presentation PCB Environmental Problem.	GPFOX00034589
568	4/16/1970	Report of Meeting with Wiggins Teape at Beaconsfield, Bucks.	MONSFOX00031834
569	4/17/1970	Letter from R. E. Keller to W. B. Papageorge re Environmental Materials Analyzed by Monsanto for PCB's	DSW 228720
570	4/17/1970	Report of Meeting with Ministry of Agriculture, Fisheries and Food	MONSFOX00034522
571	4/20/1970	Presentation of the PCB Management Plan, 1970	MONS 035424
572	4/20/1970	Minutes of Meeting of the Corporate Management Committee - Present Messrs. E. J. Bock - Chairman, H. H. Bible, J. R. Eck, J. L. Gillis, E. J. Puzzell, C. H. Sommer, M. C. Throdahl, J. N. Ehlers - Secretary	TOWOLDMON0001319
573	4/22/1970	Call Report - re: New competition for Aroclors- Introduce LJB to account, identify reasons for below budget purchases of Aroclors - Bechtold, W.R. Grace - Construction Product Division	LEXOLDMON006721
574	4/23/1970	Letter from Cumming Paton (General Offices) to D. H. Bechtold, et al. RE Aroclor/Insecticides, <u>PERSONAL AND CONFIDENTIAL</u>	MONS 099535
575	4/23/1970	Heat Transfer - Therminol FR Series (Domestic) Assumption: Why we should continue to produce and supply Therminol FR fluids	PCB-ARCH0241323
576	4/24/1970	Lemkin, Los Angeles to Wright, St. L "Swift" re: The following is in response to your request on various Swift locations in the adhesive industry. I cover two locations - Vernon, Calif. And Hayward, Calif. The latter is marginal as far as a producing location is concerned." focus on Vernon Potential - 1-1260 - 10,000 lbs; A-5460 750-1,000,000 lbs. Pushing for direct purchase form Monsanto rather than from their	
577	4/28/1970	Letter from John Mason to Hon. William F. Ryan in the House of Representatives - response to letter of April 9 regarding PCB's, bcc Bock, Eck, John, Papageorge, park, Pickard, Putzell, Rehfeld, Wheeler, Bergen, Springgate	MONS 098443
578	4/29/1970	Monsanto Memo -From Hunt to Kelly re: Aroclors - 3 generation rat reproduction and fish toxicity.	PCB-ARCH0543995
579	4/30/1970	Letter from W. B. Papageorge to J. R. Savage re <u>Aroclor Labels</u>	MONS 099556
580	4/30/1970	Memo from Emmet Kelly, M.D. to Mr. Wm. Papageorge regarding conference call with Georgia State Dept of Agriculture	MONS 099818
581	4/30/1970	Label for Aroclor 1232 "New label Layout" (in handwriting) "Caution! Contains Chlorinated hydrocarbons"	PCB-ARCH0513097
582	5/1/1970	"News in Brief: Call for Ban on PCBs" Science, New Series, 168 (May 1, 1970, 557. "Congressman William F. Ryan (D-N.Y.) has called for a ban on polychlorinated biphenyls (PCBs) an ingredient used in plastics, adhesives, aluminum foil, cellophane, and insecticides."	
583	5/1/1970	Dear Customer from W.E. Schalk, Director of Sales, Plasticizers	
584	5/1/1970	Stop sale of Pesticide extender	
585	5/4/1970	Ltr from D.A. Olson re: Therminol - PCB	PCB-ARCH0241363
586	5/5/1970	Ltr from W.E. Schalk to Customer re: Using Aroclor 1254 in industrial soaps and hand cleaner applications	PCB-ARCH0227299

Exhibit Number	Doc Date	Description	Beg Bates
587	5/7/1970	Telegram from Alice Keen, Atlanta to Talley, Anniston "Sangamo Electric Company Pickens SC tank truck of Aroclor 1242 schedule to be picked up 5-7-70. Customer advises that he will be in tomorrow to pick up this material. He was unable to pick up last week because of a leak in the truck."	PCB-ARCH0356328
588	5/11/1970	Letter from Schalk to J.W. Schrage re: Allegations that certain PCBs found in environments are contaminants and notification to customers	MON-MT-008737
589	5/11/1970	Memo from John Mason to H.S. Bergen, J.E. Springgate & W.B. Papageorge re: Charts used in presentation with CMC	MONS 205085
590	5/11/1970	Memo from H.S. Bergen to W. B. Papageorge re: the favorable CMC reaction to the latest plan for Europe	WATER_PCB-SD0000019999
591	5/13/1970	Ltr from D.A. Olson to P.J. Marsh re: PCB action plans submitted to the CMC and their approval of these plans	WATER_PCB-SD0000080317
592	5/14/1970	Clark letter to Regional Managers dated 5/14/70 1200 series Aroclors; removal of products from market	MONS 098951
593	5/18/1970	Call Report – Organic Division – Jiffy Manufacturing Company, Hillside, NJ re: Generally speaking, he [George Tasker of Jiffy] is very satisfied with his FR installations. He does have a problem spot in Salem, Apparently there has been some leakage there and much of the usual complaints."	
594	5/19/1970	Letter to Barle from Jack Garrett regarding toxicity and safe handling statement covering Therminols in general	MONS 090400
595	5/19/1970	R.V. Johnson to Willis Clark, "Aroclor Key Customers" Lists 9 in California and 2 in Oregon/Washington	PCB-ARCH0227267
596	5/20/1970	Memo from W.R. Richard to R. Davis re: Monthly Summary Details - April, 1970 Functional Fluids - Research with attached is our April, 1970 monthly summary with details for Functional Fluids-Research	WATER_PCB-SD0000041575
597	5/25/1970	Letter from Schalk to McCall re: Allegations that certain PCBs found in environments are contaminants with List of Distributors - American Mineral Spirits Company, Central Solvents & Chemicals Company, Great Western Chemical Company	MCL000202
598	5/25/1970	Ltr from J.R. Fallon to Clay, Davidson & several other Monsanto people re: Therminol FR Fluids in Applications Related to Edible Materials	MONS 099553
599	5/25/1970	Call Report to Willis Clark contacted Bill Devine & Art Sauer, Salesman Jan Smoke re: To Inform them of Aroclor plans; Essex received a sample claimed to a blend of A-1242/A-1248	TOWOLDMON0053285
600	5/27/1970	Memo from W.B. Papageorge to J.R. Durland re: PCB Environmental Problem	PCB-ARCH0000215
601	5/27/1970	Memo from J.R. Fallon to J. N. Haggart, T. Katayama, T.W. Oneson, C. Paton re: Therminol FR Fluids in Applications Related to Edible Materials	PCB-ARCH0222453
602	5/27/1970	Papageorge to G. R. Sido	
603	6/1/1970	Letter discontinuing sales of PCB - Schalk	MCL000213
604	6/1/1970	Monsanto Memo - PCB Losses to Atmosphere	MONS 098995
605	6/2/1970	Ltr from W.B. Papageorge to Mr. M.N. Sprouse re: Discuss Askarel transformers and their applications	PCB-ARCH0000197
606	6/3/1970	Letter from J. R. Fallon (St. Louis General Office) to C. L. Clay, et al. re Therminol FR Systems – Containment And Disposal Of Leakage	MONS 099539

Exhibit Number	Doc Date	Description	Beg Bates
607	6/3/1970	Sales Call Report Form from F. M. Luckett (salesman) to Bechtold, Fording, Smoke, Waychoff, Wright, Burhmann & Darby regarding Aroclors 1254, 1260 & 1268	TOWOLDMON0053982
608	6/5/1970	Letter from Z. J. Obara to Gentlemen re: a second letter from your company. Letter dated June 1 from Mr. W. E. Schalk, Director of Sales, Plasticizers	LEXOLDMON006712
609	6/5/1970	PCB Plan - Total Europe - 1969 - 1971 Gross Profit Confidential	PCB-ARCH-EXT0013284
610	6/5/1970	Sales Call Report Form from E. G. McCabe (salesman) to Walter Stroeble & Wayne Waters regarding PCB containing Aroclors	TOWOLDMON0053377
611	6/8/1970	Letter from John R. Fallon to customers indicating would discontinue sales for uses in food processing applications after July 31, 1970	MONS 089805
612	6/8/1970	Monsanto Memo - PCB Losses to Atmosphere	MONS 098935
613	6/11/1970	Letter from Donald A. Olsen to Customers (mailing list enclosed) re: Dangers of PCBs to the environment and their discontinuance of the sale of PCB- containing for industrial applications effective Aug. 30, 1970 (customer list)	MCL000231
614	6/11/1970	Letter from N.T. Johnson to Customers (distribution list attached) re: News article on PCBs discovered in some marine, aquatic and wildlife environments	MCL000311
615	6/11/1970	Memo from Paul G. Benignus to D.A. Olson re: Capacitor Aroclor 1242, MCS 1016	PCB-ARCH0053158
616	6/17/1970	Outgoing Message from W.B. Papageorge to Blank - T. Katayama, Monkasei Tokyo re: Definition of Non-controllable end uses of PCB include Polysulfide Plasticizer	PCB-ARCH0000138
617	6/17/1970	Call Report, Organic Division Marketing Department, Frito-Lay Corporation, Dallas, TX re: [Sellers, of Frito-Lay] stated that they have FR fluids in systems in Detroit, Chicago and Los Angeles, Calif. He also indicated that they do everything possible to isolate the Therminol system from the cooking and food products."	PCB-ARCH0476196
618	6/18/1970	Letter from William F. Ryan (Congress of the United States) to John Mason (Monsanto)	MONS 087863
619	6/18/1970	Biodegradability of Aroclor - to: Howard, from: Kountz	MONS 098507
620	6/19/1970	W. R. Richard to Toby Bell, Anniston, "Chlorinated Biphenyl in Chlorinated Terphenyl"	
621	6/22/1970	Memo from H.S. Bergen to W.B. Papageorge re: PCB Plan - Total Europe	PCB-ARCH0055446
622	6/22/1970	Memo W.R. Richard to E. M. Emery Polychlorinated Biphenyl Content of Aroclor 5460	PCB-ARCH0103232
623	6/30/1970	Mason letter to Ryan, dated 6/30/70	TOWOLDMON0003954
624	7/1/1970	Papageorge letter to Weimer, dated 7/1/70	MONS 089525
625	7/1/1970	"General Policy Concerning Removal of Aroclors from the Market Place" Ca. July 1970 For getting credit for returned good - must be unopened.	PCB-ARCH0476196
626	7/6/1970	Letter from Papageorge to D.E. Cavanaugh at Espey Manufacturing Co	DSW 018254
627	7/7/1970	Letter from Papageorge to Robert Cochran re visit to plant on June 25th and suggestions re disposal of PCBs	DSW 170493
628	7/7/1970	Letter from W. B. George to Mr. Gene Lewis (P. R. Mallory Company)	MONS 087413
629	7/8/1970	Letter from Papageorge to Jenkins; cc: Benignus, Olson - re- Visit to Brown St. Plant recommending disposal in landfill	PCB-ARCH0000094
630	7/14/1970	E.S. Tucker to Papageorge, "PCB content of Mississippi Carp" PCBs found in Mississippi river Carp	PCB-ARCH0620991

Exhibit Number	Doc Date	Description	Beg Bates
631	7/14/1970	July 14, 1970 letter from James E. McKee Jr. to the Miami Herald re Richard Pothior's July 9 article on PCB - a "DDT-Like poison"	MONS 088328
632	7/14/1970	Letter from W.B. Papageorge to H.S. Bergen, J. Mason, J.K. Springate re: Call received from V.H. Schwindt, Naftone, Inc rep for Farbenfabriken Bayer A.G about a rumor that Monsanto was discontinuing the manufacture of Aroclors	MONS 098180
633	7/14/1970	Willis S. Clark to Papageorge	
634	7/15/1970	New York Times Article "Monsanto Plans to Curb Chemicals" by David Rosenbaum	PCB-ARCH0056927
635	7/16/1970	Press Release - Immediately 1970 - Monsanto Cities Actions Taken on Environmental Issue	TOWOLDMON0007935
636	7/17/1970	Ltr from W. B. Papageorge to H.S. Bergen re: Review of Biodegradation studies with Munch r. Kountz, S. Tucker, E. Emery and J. Savag	DSW 280830
637	7/18/1970	Sales Contract - Sold to: Westinghouse Electric Corporation from July 1, 1970 - June 30, 1973; Goods Aroclor 1242 (Inerteens PDS - 9818 - 1) by Donald A. Olson	PCB ARCH0012281
638	7/20/1970	Monsanto Memo - Sampling of atmosphere and water for aroclor losses	DSW 015029
639	7/20/1970	Ltr from James E. McKee Jr. to Richard J. Pothier re:	PCB-ARCH0176793
640	7/20/1970	E.C. Wright to [Anniston Personnel]	
641	7/21/1970	Progress Report from Technical Services Dept - Aroclor Losses at the Anniston	DSW 013791
642	7/22/1970	Ltr from E.V. John to J.E. McKee re: The Miami Herald reporting erroneous information regarding PCB is a poison.	PCB-ARCH0176756
643	7/23/1970	Call Report - Organic Division Marketing Department: Customer Koppers Research Center; To: W.F. Waychoff re: Gilbert and Stoner will coordinate Aroclor reformulation work	WATER_PCB-SD0000078395
644	7/25/1970	Science News Article "Monsanto Reduces Sales"	PCB-ARCH0440854
645	7/27/1970	Monsanto Call Report - Organic Division, date of call 7-27-70	LEXOLDMON006717
646	7/28/1970	Papageorge letter to Herman re: contribution of PCBs in paint to contaminate the environment	MONS 087409
647	7/28/1970	Papageorge letter to Mason, dated 7/28/70	MONS 098176
648	7/28/1970	Call Report - Organic Division Marketing Department: Customer Redacted; To: Willis Clark re: Aroclor 1221 has proved far too volatile to use in alkali dispersible hot melt formulation	WATER_PCB-SD0000078388
649	8/7/1970	Anniston - OCB - Cleanup Program: Confidential - FYI and Destroy	MONS 033851
650	8/11/1970	Sales Call Report Form from E. G. McCabe (salesman) to Joe Giordano regarding discontinued Aroclors and use of S-261	TOWOLDMON0053038
651	8/14/1970	Letter to customers stating you have received our litters of Feb and June concerning withdrawal of PCBs forwarding technical bulletin o/pl-306A	PCB-ARCH0055469
652	8/14/1970	Schalk letter dated 8/14/70 During week of Aug 10 Monsanto sending to all direct customers (DISTRIBUTORS) . . .info re Aroclor Plasticizers Bulletin & General Policy Concerning Distributors' Return of Aroclors (with attachments)	TOWOLDMON0003455
653	8/18/1970	Memo Re - PCB Environmental Problem July Status Report	MONS 044657
654	8/20/1970	"PCB Newsletter; Occurrence: Gilman D. Veith and G. Fred Lee, University of Wisconsin, Madison"	PCB-ARCH0252691
655	8/24/1970	Roderick Cameron, Exec. Dir., Environmental Defense Fund To Pierre R. Wilkins Manager, Press Relations, PR, Monsanto	PCB-ARCH0620583

Exhibit Number	Doc Date	Description	Beg Bates
656	8/31/1970	Letter from W. B. Papageorge, Manager of Environmental Control of Monsanto, to Dr. B. M. Continelli	MONS 087400
657	8/31/1970	Papageorge to Benignus, et al. re: Attached first draft of suggestions for PCB control which I propose be made available to our customers in helping us 'close the loop.	PCB-ARCH0000002
658	9/1/1970	Aroclor Waste Monthly Report - No day	DSW 013188
659	9/1/1970	Polychlorinated Biphenyls Another Long-Life Widespread Chemical in the Environment David B. Peakall and Jeffrey L. Lincer	NEV 018759
660	9/1/1970	Wheeler to R.C. Smith, TVA re: askarel fluids present any potential public health hazard	PCB-ARCH0544865
661	9/2/1970	W. A. Krull, Technical Services Dept. to R. M. McCutchan	PCB-ARCH0302277
662	9/5/1970	Task Force Sept. 5 Meeting Handwritten Objectives	PCB-ARCH0443096
663	9/8/1970	Olson letter to Clark, dated 9/8/70	DSW 281137
664	9/8/1970	Memo re - PCB Environmental Problem August Status Report	MONS 099620
665	9/14/1970	John Mason to Bergen, "PCB's Review with CMC"	PCB-ARCH0252628
666	9/14/1970	Meeting Minutes of Corporate Management Committee	TOWOLDMON0003483
667	9/15/1970	Memo from E. S. Tucker to Papageorge re PCB Analysis of Florida Soil	MONS 099164
668	9/18/1970	Confidential Memo from Paul B. Hodges to Toby Bell re proposed letter to Joe Crockett on Increased Emissions	DSW 014095
669	9/21/1970	Letter from R. C. Neal and A. E. Peterson (J. F. Queeny Plant) to P. F. Gatens, et al. re Aroclor Use at JFQ, CONFIDENTIAL	MONS 098222
670	9/21/1970	Monsanto Call Report Customer Singer Manufacturing to N.T. Johnson re: fluid consumption from 9 die cast machines	PCB-ARCH0483916
671	9/25/1970	Letter from J. R. Savage (General Office) to Mr. A. E. Peterson (J. F. Queeny Plant): <u>PCB Pollution</u>	MONS 098221
672	9/29/1970	PCB Effects on Mammals	MONS 034661
673	10/1/1970	Monsanto letter from Papageorge to Viland Westinghouse Electric Co. Re - Disposal of Aroclor - Resolving the solid material disposal problem the PA state agency	MONS 089532
674	10/5/1970	Letter from W. B. Papageorge to File	MONS 098491
675	10/6/1970	Memo re - PCB Environmental Problem September Status Report	MONS 049234
676	10/7/1970	Performance Review - 1970 Objectives - Polychlorinated Biphenyl Environmental Problem	MONS 035463
677	10/12/1970	Ltr from Randal Graham re: The polychlorinated biphenyl (PCB) Environmental Pollution problem	DSW 009724
678	10/13/1970	Letter from Elmer P. Wheeler (Medical Department) to W. B. Papageorge: PCB's in Human Adipose Tissue	PCB-ARCH0288488
679	10/15/1970	Ltr from Merlin J. Auzine to The Secretary, Ministry of Industrial Development and Internal Trade re: Polychlorinated Biphenyls	MONS 087792
680	10/15/1970	Sales Call Report Form from J.H. Gannon (salesman) W.S. Clark cc: Len Berlik regarding call Keith Cranker, Section Head Polysulfide Caulks and Sealants; Murray Rosen & Don Lyons, Chemist to discuss status of Aroclor 1254 replacement program	TOWOLDMON0054521
681	10/19/1970	Monsanto Appropriation Request to E. J. Bock, Title: Control, Reclamation, and Disposal of Aroclor Wastes	MONS 036154
682	10/24/1970	First DDT, now PCB; Science News 41-119 Wkly 110.500	MONS 032385
683	10/28/1970	Document titled "Public Relation Department", Press Query, Source: Elmer Wheeler and Files, dated 10-28-70	DSW 502601

Exhibit Number	Doc Date	Description	Beg Bates
684	11/5/1970	Request for Renewal of Contract dated November 5, 1970, between Monsanto Company and Biological Consultants	PCB-ARCH0007980
685	11/10/1970	Letter from W. B. Papageorge to P. J. A. Marsh, et al.: PCB Environmental Problem -- October Status Report	MONS 044665
686	11/10/1970	Memo from J. H. Gannon to J. J. McNamara, E. H. Fording & L. J. Berlik regarding Aroclor Replacement Program	TOWOLDMON0054529
687	11/11/1970	Letter from W. B. Papageorge to P. G. Benignus re "Letter Dated Oct. 27, 1070, R. F. Casey, Ohio Edison to P. G. Benignus"	MONS 098192
688	11/13/1970	Outgoing Message Blank - Jerry Davidson to DE Roush re: Bob Parker of Foremost detection of Therminol in cooking oil.	TOWOLDMON0055319
689	11/19/1970	Letter from J.J. Kark to Donald L. Peyton, ANSI re: Proposed American National Standards Committee on Disposal of Askarel Used in Electrical Equipment	B000001
690	11/30/1970	Monsanto Memo - PCBs from E.V. John to Papageorge	MONS 099530
691	12/1/1970	Monsanto - Standard Manufacturing Process for Pydraul A-200	DSW 015034
692	12/7/1970	Memo from W.B. Papageorge to J.R. Savage re: PCB environmental control program was to control the losses of PCB in our plants	DSW 347729
693	12/9/1970	Peter Nichols, "Facts on Pollution Said to be Withheld," The Times, Daily News Digest Service	PCB-ARCH0056407
694	12/15/1970	Papageorge to Richard Malloy, McCulloch Corp., Los Angeles re: interest and concern regarding the type and amount of pollution that can be tolerated in a plant waste effluent	MONS089535
695	12/15/1970	Letter to H. A. Vodden from Papageorge regarding delay in publication for study that would hurt aroclor	PCB-ARCH0000443
696	12/16/1970	Benignus to Bergen	
697	12/17/1970	Call Report - Customer Cherolet Grey Iron Foundry to N.T. Johnson, Salesman G.F. Fague re: Answer trouble shooting calls - workers complaining of fumes on Pydraul 312	PCB-ARCH0485991
698	12/29/1970	Memo from A.E. Peterson to P.B. Hodges, W.B. Papageorge, J.R. Savage re: Aroclor Loss - Status Report	PCB-ARCH0008584
699	1/1/1971	Functional Fluids Business Group 1971 Objectives	PCB ARCH0055519
700	1/1/1971	"Specialty Products, "Aroclor Environmental Program"	PCB-ARCH0297546
701	1/1/1971	Item - 5 Attachment B PCB Returns 1971 Chart	PCB-ARCH-EXT0046292
702	1/6/1971	T. N. Carrico, Krummrich to G.L. Bratsch	PCB-ARCH0008582
703	1/15/1971	Ltr from W.B. Papageorge to W. L. Luke re: Pydraul 312 classified as a pollutant or non-pollutant	PCB-ARCH0487768
704	1/20/1971	Letter to Severson	MONS 099489
705	1/21/1971	Letter to Hugh Lowrey from Willis Clark re- PR notice 70-25; USDA	MONS 089762
706	1/25/1971	Letter from P. G. Benignus (St. Louis) to P. J. A. Marsh (Brussels)	PCB-ARCH0551540
707	1/29/1971	Letter from W. B. Papageorge (St. Louis) to J. Savage re PCB in Plant Effluent	MONS 098414
708	2/1/1971	Specialty Products, "Aroclor Environment Program"	MONS040382
709	2/1/1971	MCS 1016 - An Environmental Compatible Aroclor; Analytical Chemistry Special Study 71-2 Job. No. 13480	PCB-ARCH0178519
710	2/2/1971	Letter from E. S. Tucker to W. B. Papageorge: Analysis of GE Pittsfield Milk Samples for Polychlorinated Biphenyls	MONS 099186
711	2/2/1971	Letter from Jack D. Early (Washington, D. C.) to W. B. Papageorge	MONS 100011
712	2/3/1971	Letter from Dr. R. E. Kelly, Medical Director at Monsanto, to Dr. O. E. Quinby (Consulting Toxicologist, Wenatchee, Washington)	MONS 089553

Exhibit Number	Doc Date	Description	Beg Bates
713	2/8/1971	Letter from W. B. Papageorge to P. J. A. Marsh, et al.: PCB Environmental Problem, January Status Report	MONS 099646
714	2/8/1971	"Call Report – Organic Division, National Lead Company, South Amboy, NJ," by J. S. Pullman, New York Office	PCB-ARCH0488402
715	2/11/1971	Call Report - Customer Chevrolet-Tonawanda Plant, New York to N.T. Johnson; Salesman John Heilala re: call to discuss their findings on their Pydraul 135 test	MONS 077567
716	2/12/1971	George C. Rankey, Jr. To Jim Thorne, et al, "PCB Article"	PCB-ARCH0300282
717	2/15/1971	Wheeler to Papageorge, "Administrative Proposal for Control of Toxic	PCB-ARCH0175978
718	3/1/1971	"Info used by J. Mason to report to CMC in March 1971. No written commentary was prepared" "from the desk of W.B. Papageorge"	TOWOLDMON0051179
719	3/4/1971	Document from Papageorge re: Info used by J. Mason to report to CMC in March 1991 - Non-Controllable Ends Uses (Plasticizers)	TOWOLDMON0051179
720	3/8/1971	M.N. Johnson, MD, Medical Department to Papageorge	PCB-ARCH0621168
721	3/8/1971	Minutes of Meeting of the Corporate Management Committee on March 8, 1971	TOWOLDMON0003486
722	3/24/1971	Cancer and Chlorinated Biphenyls - JN Haggart - Brussels	MONS 099948
723	3/26/1971	Letter from John Mason to Hon. William F. Ryan, House of Representatives, re progress in implementing programs referred to in his letter dated 6-30-70	MONS 089842
724	3/26/1971	"Call Report – Organic Division, AIRCO Vacuum Metals, Berkeley, CA"	PCBARCH0485103
725	3/30/1971	Letter from R. E. Keller to File: Aroclor – Michigan Department of Health – Dr. Price	MONS 100033
726	4/1/1971	Aroclor resins and plasticizers for chlorinated rubber; Technical Bulletin No. O/PL-311	PCB-ARCH0232767
727	4/2/1971	Management Plan - 1971 Polychlorinated Biphenyl Environmental Problem	MONS 041654
728	4/5/1971	Clark letter to Morlock	MONS 099749
729	4/6/1971	Financial Times, "Sweden Regulates Use of PCB"	PCB-ARCH0049196
730	4/8/1971	Ltr from James J. Roder to C. Boutin, Santa Clara re: Possible increase in	PCB-ARCH0076536
731	4/15/1971	Letter from Papageorge to H. S. Bergen re PCB-Solid Waste Incinerator	DSW 171159
732	4/15/1971	Sales Call Report Form from J. M. Van Gelder (salesman) to Tom Toomey regarding Aroclor replacements, inventory and new polysulfide products	TOWOLDMON0053052
733	4/15/1971	Ltr from C. Larry Bradford re: Urged that care be taken to prevent the escape of hydraulic fluids containing PCBs into the environment	WATERPCB0000052874
734	4/19/1971	Ltr Mr. Joseph Giordano to W.B. Papageorge re: status on our chlorinated terphenyl product line	PCB-ARCH0488860
735	4/19/1971	Papageorge to A.J. Rego, Cincinnati	
736	4/21/1971	Letter from Willis S. Clark to M. J. Harrison (London): Swift and Company, LTD	MONS 098562
737	4/21/1971	Chemical Week - Pollution cop's lot not 'appy Despite complaints from government and customers, Monsanto is pushing ahead with 2-million plan to curb pollution by PCB; Monsanto Plays Policeman to Solve Environmental Problem article Chemical Week	NEV 018908
738	4/21/1971	Papageorge, "Management Plan – 1971: Polychlorinated Biphenyl Environmental Problem"	PCB-ARCH0033703
739	5/1/1971	Letter from A.M. Salazar, ANSI Committee, C107 to EPA re: Monsanto and NEMA formation of American National Standards Committee developing procedures for the use, maintenance, and disposal of askarel and askarel-soaked materials	NPC00006499

Exhibit Number	Doc Date	Description	Beg Bates
740	5/7/1971	Monsanto Call Report, dated 5/7/71	TOWOLDMON0053999
741	5/13/1971	Partial Listing of Therminol Heat Transfer Fluid Users with Reference to Typical Instructions	PCB-ARCH0636322
742	5/19/1971	"PCB's – Environmental Hazard – Should be Banned," Rep. William F. Ryan, Congressional Record, House, H4112.	PCB-ARCH0543081
743	5/24/1971	Press Query by Bill Gray Metro -East Journal Question & Answer	PCB-ACRH0046113
744	5/25/1971	Call Report 5/25/1971 Customer Name Benjamin Moore Company to J.R. Fallon, L.D. Shand, P.L. Slayton re: Problems with leaky bungs on Therminol drums	PCB-ARCH0203203
745	5/26/1971	Daily News Record, "Federal Bill would Ban Use of Polychlorinated Biphenyls"	PCB-ARCH0543095
746	6/3/1971	Kelly to Vodden, Ruabon	PCB-ARCH0177686
747	6/15/1971	Report to Monsanto Company Toxicity, Reproduction and residue Study with Aroclor 1242, Lot #AK-255 in white Leghorn Chickens 6/15/1971 IBT No. J8746 from J.C. Calandra to Elmer P. Wheeler	PCB-ARCH0144476
748	7/1/1971	Document titled "Monsanto Company Policy Statement", dated 7/71	DSW 117325
749	7/2/1971	Ltr from Orville Mueth to Don Mayer re: Customers Problem Report Intl-8-2 Investigation in to leaking filled drums of Therminol FR 1	PCB-ARCH0203210
750	7/12/1971	Papageorge to Jasper USDA:	PCB-ARCH0000723
751	7/16/1971	Letter from T. L. Gossage to J. R. Fallon: Therminol FR Fluids	MONS 098400
752	7/19/1971	Letter from John Mason to J. R. Fallon: Therminol FR Series Products	MONS 098252
753	7/19/1971	JM, "Procedure for Handling Therminol FR Series Sales"	PCB-ARCH 0007865
754	7/21/1971	Ltr from J. J. Roder to Cliff Boutin re: use of FR in plastic wrap application suggested replacing with Therminol 55 or 66	PCB-ARCH0076406
755	7/22/1971	Memo from P.G. Benignus to C.L. Curtis re: Askarel Inspection and Maintenance Guide	PCB-ARCH0012145
756	7/23/1971	"Call Report – organic Division, AIRCO Vacuum Metals, Berkeley, CA"	PCB- ARCH0485106
757	7/25/1971	The Washington Post "Law Sought to Ban DDT-Like Chemical" by Hank Burchard	PCB-ARCH0562210
758	7/26/1971	Farm Unit, Producers Hunt for Chicken Tied to Contaminate Feed The Wall Street Journal Staff Reporter	MONS 031780
759	7/26/1971	John Kriss to J. J. Roder	PCB-ARCH0077983
760	7/27/1971	Ltr from Willis S. Clark to Cumming Paton re: Mexico/Aroclor 1254	PCB-ARCH0064815
761	7/28/1971	J.R. Fallon, Product Manager, Heat Transfer, Dielectrics and Process Fluids to Coffee Division, Great Atlantic and Pacific Tea Company	PCB-ARCH0048637
762	7/29/1971	Millions of Chickens Tainted Washington Post by Hank Burchard	PCB-ARCH0046137
763	7/30/1971	Memorandum for the Record - Updated review of toxicity studies of PCB's to Dr. Leo Friedman	M 42593
764	7/30/1971	Blair WM. Poultry Found Safe for Eating Despite Contamination of Feed. <i>NY Times</i> , July 30, 1971, p. 15.	MONS031907
765	7/30/1971	Robert Brell, Product Manager, specialty Plasticizers, to Robert J. Stirn, United Resin Corporation, Brooklyn, NY	PCB- ARCH0489952
766	7/30/1971	New York Times "Poultry Found Safe for Eating Despite Contamination of Feed by William M. Blair	PCB-ARCH0132704
767	8/1/1971	Organic Chemicals Division, Confidential, "Environmental Analytical Studies Jan-Aug 1971	MONS058618
768	8/1/1971	J.J. Roder, Product Supervisor, Heat Transfer Fluids to "Gentlemen"	PCB-ARCH0738052

Exhibit Number	Doc Date	Description	Beg Bates
769	8/2/1971	Letter from Bernard H. Falk to All Representatives of Member Companies in the Transformer Section and Capacitor Section re: H. R. 10085 - A Bill to Prohibit PCB	TOWOLDMON0001321
770	8/3/1971	James J. Roder, Product supervisor, Heat Transfer Fluids to George Farmer, National Can company, Baltimore, MD	PCB- ARCH0076371
771	8/3/1971	D. E. Roush to Field Salesmen, "Board & Paper Coating Equipment"	PCB-ARCH0077969
772	8/4/1971	Senate Unit Told of Fish Tainting	MONS 031910
773	8/4/1971	Statement of Robert Rosebrough before the committee on Commerce United States Senate	MONS 212803
774	8/6/1971	Letter from J.J. Roder to OEM List re: Equipment which may contain one or more of the Therminol FR series heat transfer fluids	MCL00842
775	8/6/1971	E. Wheeler to D. Otto re- PCB Literature search	MONS 029656
776	8/10/1971	Ltr from P.G. Benignus to E.M. Potter re: Leaky Drums	PCB-ARCH0012107
777	8/10/1971	Meeting Summary 8/10/1971 Goodyear Tire & Rubber Co.	PCB-ARCH0077930
778	8/15/1971	Letter from Biological consultants re - PCB residue analysis	DSW 013391
779	8/16/1971	Memo from John Mason to Mr. J.R. Eck re: Therminol FR Series Fluids	PCB-ARCH0738095
780	8/18/1971	Memo from Bob Bevacqua to D. R. Hansen re phone call from Dave	DSW 178169
781	8/19/1971	"60,000 Tainted Eggs Eaten in 2 Weeks Here," <u>Washington Post</u>	MONS031776
782	8/23/1971	JM, "Proposed Completion of Mr. J.R. Eck's Statement"	PCB-ARCH0242238
783	8/24/1971	Memo from E.R. Hendrick to R.D. Sadow re: Aroclor - Therminol Usage - Texas City	PCB-ARCH0033722
784	8/25/1971	Papageorge, "PCB Environmental Problem, July Status Report,"	PCB-ARCH0033480
785	8/26/1971	Call Report, Organic Division, Oregon Steel Mills, Portland, OR	PCB-ARCH0060394
786	8/26/1971	Call Report, Organic Division, Kaiser Aluminum, Tacoma, Washington	
787	8/30/1971	"FDA, USDA Face Problem of Widespread PCB Contamination," <u>Food Chemical News</u> .	PCB-ARCH0499880
788	9/1/1971	Organic Chemicals Division, Confidential, "Environmental analytical	MONS057074
789	9/3/1971	Ltr from H.S. Bergen to J. Mason, C.J. Smith, J.E. Springgate re: change	MONS 098973
790	9/3/1971	Science American Association for the Advancement of Science Vol. 173 No. 4000	PCB-ARCH0441430
791	9/3/1971	Science Vol. 173. No. 4000; PCB's: Leaks of Toxic Substances Raises Issues of Effects, Regulation by Joe Pichirallo; Combined List 240	PCB-ARCH0441430
792	9/7/1971	Memo from W.R. Richard to John Mason re: Polychlorinated Biphenyls Research Summary	PCB-ARCH0055400
793	9/14/1971	Papageorge presentation to ANSI committee meeting September 14, 1971; Papageorge presentation to ANSI committee meeting September	TOWOLDMON0001218
794	9/19/1971	Los Angeles Times "A New Chicken and Egg Riddle: PCB Pollution" by James Bassett	PCB-ARCH0058665
795	9/22/1971	A DDT-Like Liquid Studied for Hazards by Richard D. Lyons; Panel Organized to Study DDT-Like cont. article	MONS 033675
796	9/22/1971	Cumming Paton, "H.E.W. News Release on PCBs," Sales Information Bulletin No. 54, September 22, 1971	MONS 071467
797	9/23/1971	Richard K. Weil, "Health Peril Seen in GE Transformer oil," The Berkshire Eagle	PCB-ARCH 0593397
798	9/29/1971	"Food and Drug Administration" [From FDA]	PCB ARCH 0055817-9
799	9/30/1971	"Monsanto Limits Food Plants' Use of Chemical PCB," <u>Washington Post</u> , Sept. 30, 1971, p. A25.	PCB-ARCH0473245

Exhibit Number	Doc Date	Description	Beg Bates
800	9/30/1971	Attached handouts from the FDA press conference sent by Sam Pickard - Statement by Charles C. Edwards, M.D. PCB Press Press Briefing September 29, 1971	TOWOLDMON0003493
801	10/1/1971	Organic Chemicals Division, Confidential, "Environmental Analytical	MONS058632
802	10/4/1971	Papageorge to Ralph Allen, Anaconda Aluminum Co	PCB-ARCH0001407
803	10/6/1971	Letter to W. R. Richard from H. A. Vodden re: pond experiment	PHGNCR-2001738
804	10/7/1971	Pogue to Keller (EI DuPont)	PCB- ARCH0485948
805	10/8/1971	Ltr from W.B. Papageorge to Dr. M.W. Miller re: Study of the total PCB problem	PCB ARCH0001391
806	10/10/1971	E. F. Porter, "Contamination from PCB is Traced to its Source" St. Louis Post-Dispatch	
807	10/11/1971	Copy of The Menace of PCB, Time Article	MONS 031710
808	10/11/1971	Papageorge to Kenneth Smith, American Dehydrators Association, Kansas City, MO	PCB-ARCH0001368 PCB-ARCH0001369
809	10/11/1971	Letter from James J. Roder to C. Paton Re: Trip Reports FR System Conversions	PCB-ARCH0008950
810	10/12/1971	Papageorge to Dr. Virginia Stout, National Marine fisheries Service,	PCB-ARCH0001365
811	10/13/1971	Monsanto Memo - Aroclor 1260	MONS 098891
812	10/13/1971	Memo from John to J.G. Frederiksen re: PCB Problem Disposal of Askarel Type Fluid	PCB-ARCH0421902
813	10/14/1971	Letter from Cumming Paton (Monsanto) to H. R. Ford, et al. re Status of PCBs	MONS 098558
814	10/14/1971	Cumming Paton, Functional Fluids, Sales Information Bulletin No. 58," Subject: Dielectric Fluids – Environmental Safety"	PCB-ARCH0007776
815	10/21/1971	Letter from F. J. Holzapfel to Plant Managers: PCB Potential	MONS 099485
816	10/26/1971	Letter from P. G. Benignus (Monsanto) to General Electric	MONS 098309
817	10/26/1971	Chronology of Communications to PCB Customers	PCB-ARCH0455549
818	10/27/1971	Michael W. Palmer, Staff Attorney, EDF to Papageorge	PCB-ARCH0246505
819	11/4/1971	Papageorge letter to Risebrough dated 11/04/71	DSW 171513
820	11/4/1971	Ltr from W.B. Papageorge to Paul Thompson re: PCBs contamination	MONS 093991
821	11/8/1971	Sales Call Report from J. H. Gannen (salesman) to Beightol, Fording, Morlock, Berlik & Bechtold regarding determine status of replacement of Aroclor 1254 in polysulfite caulks and sealant	TOWOLDMON0054537
822	11/8/1971	Call Report Customer W.R. Grace Construction Products Division to W.S. Clark re: Determine status replacement of Aroclor 1254 in polysulfite caulks and sealants	TOWOLDMON0054537
823	11/11/1971	Letter from D. B. Hosmer to Monsanto, J. T. Garrett, D. B. Hosmer, G. L. Jessee, and J. P. Landwehr: Meeting at Southwest Regional Office of EPA, COMPANY CONFIDENTIAL	MONS 040070
824	11/11/1971	Letter from R. E. Keller to W. B. Papageorge: <u>PCB's In Products</u> , <u>CONFIDENTIAL</u>	MONS 098331
825	11/11/1971	PCBs - The Electrical Industry Steering Committee - ANSI - C107	PCB-ARCH0226446
826	11/12/1971	November 11, 1971 Meeting at Southwest Regional Office of EPA. Subject: PCB Effluents from Anniston Plant to Snow Creek, Choccolocco Creek, Etc., by D. B. Hosmer	DSW 014380

Exhibit Number	Doc Date	Description	Beg Bates
827	11/18/1971	Memo from P.G. Benignus to All Members of the Special Working Groups to Prepare Preliminary Recommendations for the Capacitor and Transformer Subcommittees, of the Ansi Committee, C107, on Use and Disposal of Askarel and Askarel-soaked Materials; Working Group on Transformers; Working Group on Capacitors re: Agenda for the Wednesday, December 15, 1971 Meetings	ADM 007379
828	11/22/1971	James J Roder, Product Supervisor, Heat Transfer Fluids to T. N.Robson, Chemetron Corporation, Huntington, WV	PCB-ARCH0080024
829	11/29/1971	Report on a Bureau International Technique (BIT) Meeting on PCB Pollution by PJA Marsh	MONS 042750
830	11/29/1971	Engman, Krummrich to Bratsch "PCB Potential Contamination"	PCB-ARCH0268527 PCB-ARCH0268528
831	11/30/1971	Letter from Papageorge to Risebrough with 11-30-71 press release titled "Monsanto Releases PCB Production Figures to Department of	No Bates
832	12/1/1971	John Mason, Director, Functional Products Groups, Draft Letter to Heat Transfer Customers	MONS087665
833	12/1/1971	Memo from P.G. Benignus to E.M. Potter re: Leaky Askarel Drums	PCB-ARCH0008304
834	12/1/1971	Bioassay Report by Bionomics, Inc. Acute toxicity of Aroclor 1016, Aroclor 1242, and DDT to bluegill (<i>Lepomis macrochirus</i>) and channel catfish (<i>Ictalurus punctatus</i>) during 21 days continuous exposure to the chemicals in water	PCB-ARCH0049460
835	12/7/1971	PCB Manufacture and Sales Monsanto Industrial Chemicals Company 1963 thru 1971	PCB-ARCH0050219
836	12/8/1971	Memo from C.L. Bradford/J.H. Davidson to T.L. Gossage re: Industrial Hydraulic Fluids Transition Plan	PCB-ARCH0032651
837	12/9/1971	North Wilkeksboro, N. C. Journal-patriot, Holly Farms Sues For \$68 Million	MONS 069839
838	12/15/1971	Letter from Howard Bergen to Customers (Directors of Purchases) re: no	MCL001107
839	12/15/1971	Meeting of Capacitor and Transformers Working Groups; of the ANSI Committee, C107, on the Use and Disposal of Askarel and Askarel-Soaked Materials	TOWOLDMON0047765
840	12/16/1971	Meeting Minutes - Meeting with Monsanto on Interteen; Monsanto & Westinghouse 12/16/1971 at St. Louis	WATER_PCB-SD0000026426
841	12/17/1971	Memo from P. G. Benignus to E. M. Potter re leaking drums	DSW 180357
842	12/17/1971	Paton and Clark letter to directors of marketing, etc., dated 12/17/71	DSW 204764
843	12/17/1971	Heat Transfer Accounts - Key Customers to Monsanto or because of Therminol Fr Fluid Volumes	TOWOLDMON0057964
844	12/17/1971	Letter from C Paton to Regional Managers, Field Salesman, & Papageorge re: Changes in PCB Product Line	TOWOLDMON0058800
845	12/22/1971	Ltr from P.G. Benignus to R.S. Hill re: Aroclor Drums	PCB-ARCH0012434
846	12/23/1971	R. B. Spanholtz "Leaking Aroclor Drums, Department 246"	PCB-ARCH 0202288
847	12/29/1971	Ltr from W.B. Papageorge to Mr. C.K. Shuman re: Discovery of PCBs in horse feed	MONS 093997
848	12/30/1971	Letter from J. F. McAllister to Edward J. Burger re Benefits of PCB Use, with an attached PCB report.	MONS 201797
849	12/31/1971	Memo from E.R. Boquist to Geines, Jr., Herwald, Kelly, Madelcorn, Shoupp, Wiener re: Attached Copy of "The Need for Continued Use of Polychlorinated Biphenyls as Electrical Insulating Liquids	C000153
850	1/1/1972	"A Guide to Accumulation and Shipment of Waste Askarel Fluids"	MONS074772
851	1/1/1972	Aroclor Literature 1/1972	No Bates

Exhibit Number	Doc Date	Description	Beg Bates
852	1/1/1972	Reclamation Strategy	PCB-ARCH0031866
853	1/1/1972	Dielectrics Report 1972 with Goals & Action Plans	PCB-ARCH0178612
854	1/1/1972	"Status Reports: PCB/PCT Implementation Program"	TOWOLDMON0058860
855	1/1/1972	Ltr from E.L. Raab to Dept. Dielectric Systems Laboratory, ISLO re: Electric and Nuclear Sub-Council National Industrial Pollution Control Council Report on "The Need for Continued Use of Polychlorinated Biphenyls as Electrical Insulating Liquids	PCB-ARCH0016290
856	1/3/1972	Ltr from E.L. Raab to Dept. Dielectric Systems Laboratory, ISLO re: Electric and Nuclear Sub-Council National Industrial Pollution Control Council Report on "The Need for Continued Use of Polychlorinated Biphenyls as Electrical Insulating Liquids	DSW 380508
857	1/3/1972	The Need for Continued Use of Polychlorinated Biphenyls as Electrical Insulating Liquids. By E.R. Boquist.	MONS 040423
858	1/5/1972	The Need for Continued Use of Polychlorinated Biphenyls as Electrical Insulating Liquids by Electrical and Nuclear Sub-Council National Industrial Pollution Control Council	NPC00018861
859	1/7/1972	Discontinuation of Therminol FR Sales Question and Answers	MONS 095904
860	1/10/1972	Memo from J.J. Roder to C. Paton re: Chemical Cleaning Methods for Therminol FR	PCB-ARCH0506095
861	1/11/1972	Memo from E.L. Raab to J.T. Batty, P.G. Benignus, L.L. Dengler, J.C. Dutton, R.W. Frahm, W.B. Gaither, D.F. Haywood, E.C. Hoffman, T.H. Lee, C.J. Meloun, T. L. Mayes, F.G. McKerr, L.A. Morgan, R.C. Osthoff re: Westinghouse Report on "The Need for Continued Use of PCBs as Electrical Insulating Liquids" To NIPCC	ADM 007826
862	1/11/1972	T.L. Gossage to H. S. Bergen	PCB-ARCH0031284
863	1/13/1972	Memo from E.S. Tucker to W.B. Papageorge re: PCB's in Dishwasher Detergents	MONS 099114
864	1/13/1972	JARD Company to Howard Bergen	PCB-ARCH0452110
865	1/14/1972	Letter from Bio-test; Handwritten Memo from Industrial Bio-test Otis Fancher re carless data collection	M 42627
866	1/14/1972	Chemical Pollution: Polychlorinated Biphenyls by: Allen L. Hammond Science, Vol. 175	MONS 206054
867	1/14/1972	Edmund Greene, St. L. to J.P. Berndt, St.L. et al.	PCB-ARCH0506492
868	1/14/1972	Willis S. Clark, General Offices to group, "Aroclor Withdrawal"	PCB-ARCH0506499
869	1/17/1972	P. W. Gann to C. Paton, "Therminol FR conversion Status Week of January 17, 1972	PCB-ARCH0506108
870	1/18/1972	Ltr from E.M. Potter to H.S. Bergen re: Aroclor Drums	MONS 098406
871	1/20/1972	Memo from F. J. Camargo (St. Louis) to All Monsanto Offices re PCB-Heat Transfer Fluids Therminol FR	MONS 099788
872	1/26/1972	Memo from W. Muir to Edward Burger re PCB's.	FDA014180
873	1/27/1972	Memo from E. Greene to J.P. Berndt re: discontinuance of sales of polychlorinated biphenyls and terphenyls	PCB-ARCH0738866
874	1/31/1972	Ltr from Willis S. Clark to J.E. Springgate re: Aroclor Withdrawal/Koppers Company	PCB-ARCH0030312
875	1/31/1972	Howard Bergen, Director Specialty Products Group to "Dear Sir"	PCB-ARCH0032801
876	2/1/1972	Ltr from Papageorge to Ralph H. Lee re: problem of disposing of solid waste contaminated with PCBs	PCB-ARCH0735118
877	2/2/1972	Letter from W.B. Papageorge to Dr. A. Posefsky & E. L. Raab re an enclosed Question and Answer list for responding to PCB inquiries.	DSW 018940

Exhibit Number	Doc Date	Description	Beg Bates
878	2/3/1972	Food and Drug Administration Compliance Program Guidance Manual Chapter 6 Dairy Industry Subject: Survey: Polychlorinated Biphenyls in	PCB-ARCH0738895
879	2/4/1972	Gann "Therminol FR Conversion Status, Week of January 31, 1972	PCB-ARCH0009418 (0009854)
880	2/7/1972	Memo from Cumming Paton to T.L. Gossage re: Monthly Report Jan. 1972	PCB-ARCH0185308
881	2/8/1972	Monsanto Letter to General Electric	MONS094002
882	2/8/1972	T.L. Gossage, Marketing Director, Specialty Products Group, St. Louis to H.S. Bergen, "Dielectric Letters/Customers,"	PCB-ARCH0031273
883	2/8/1972	Howard Bergen, director, Specialty Products to Robe Deutschmann Laboratories, Canton, MA	PCB-ARCH0031349
884	2/10/1972	T.L. Gossage, Marketing Director, Specialty Products Group, St. Louis to H.S. Bergen, and others: "Dielectric Letters/Customers," Attaches letter:	MONS091901
885	2/10/1972	Memo from Papageorge to C. Paton re: PCB Disposal - EX. U.S.	PCB-ARCH0001708
886	2/10/1972	Robert Sido to Don Pogue	PCB-ARCH0512984
887	2/11/1972	Call Report - Organic Division, Dow Metal Products, Russellville, Arkansas	PCB-ARCH0491416
888	2/14/1972	Bergen to M.A. Schullen, Stearns Magnetics, Wisc.	PCB-ARCH0031531
889	2/16/1972	Springgate, Director, Plasticizers to Liggett, Airco Speer Electronics	MONS091877
890	2/17/1972	Letter from C. Paton to Charles L. Allya re: Jan. 17th letter concerning Allya's proposed procedures for the unwise dumping of wash water containing Therminol FR	WATER_PCB-SPO00000169
891	2/17/1972	"Letter to transformer mfrs we supply of top-up and service shops"	
892	2/23/1972	Mullins to Jessee, re: PCB Removal Technology.	PCB-ARCH0005486 (0005830)
893	2/23/1972	Gann to Paton, "Therminol FR Conversion Status Week of February 14, 1972"	PCB-ARCH0099712
894	2/23/1972	D.R. Pogue to R. Stohr, "Distributor Contracts	PCB-ARCH0733688
895	2/24/1972	Memo from J.J. Roder to C. Paton re: Trip Report	PCB-ARCH0077143
896	2/28/1972	Bergen to "Dear Sir"	PCB-ARCH0011601
897	2/28/1972	Call Report - Organic Division, Research Cottrell, Bound Brook, NJ	PCB-ARCH0494074
898	2/29/1972	Papageorge to File	PCB ARCH 0132669
899	3/3/1972	P. W. Gann, Therminol FR Conversion Status, week of February 28, 1972	PCB-ARCH 0100625-26
900	3/6/1972	Jonathan Spivak, "FDA to Propose Tighter Limits on PCBs in Effort to Cut	MONS070989
901	3/6/1972	Memo from J.J. Roder to P.W. Gann re: Chevron Oil. Co. Harvey, LA	PCB-ARCH0491688
902	3/7/1972	Monsanto Company, Elizabeth NJ, Empty Container Receiving Report	PCB-ARCH0099905
903	3/8/1972	Memo from H.S. Bergen & E. Greene re: PCB Dielectric Sales	MONS 100065
904	3/9/1972	Memo from R.H. Munch to W.B. Papageorge re: ANSI Committee C-107 proposed guidelines for handling askarels in the manufacture of capacitors	PCB-ARCH0112928
905	3/13/1972	Memo from Cumming Paton to Haggart, Katayama, Camargo, Sperberg, Tomlins, Louis, Chew, Garnsworthy, Goodwillie re: PCB Disposal - ex	PCB-ARCH0032327
906	3/21/1972	Memo from J.J. Roder to C. Paton re: Call Report	WATER_PCB-SD0000078402
907	3/24/1972	Memo from P.W. Gann to C. Paton re: Therminol FR Conversion Status Week of March 20, 1972	MCL001243
908	3/29/1972	Agreement between Monsanto and GE, "Special Undertaking by Purchasers of Polychlorinated Terphenyls"	PCB-ARCH0029792
909	3/30/1972	G.R. Sido to Papageorge	PCB-ARCH0513357
910	4/1/1972	Letter from Papageorge re the PCB environmental situation, April 1972	MCL002272
911	4/1/1972	Environmental Health Perspectives Experimental Issue No. 1 Dept. of Health Education and Welfare Public Health Service National Institutes of Health	MONS 208101
912	4/3/1972	Letter from H. S. Bergen to R. H. Munch: Dielectric Fluids Strategy	MONS 098416

Exhibit Number	Doc Date	Description	Beg Bates
913	4/3/1972	Memo from J.H. Davidson to File re: Ralston Purina	PCB-ARCH0011505
914	4/3/1972	Memo from E. Greene to F. Camargo/N. Kamper, George Chew, Garnsworthy, Hill, Inouye, Sperberg, White, Tomlins, Louis re: Monsanto would no longer make or sell transformer Inerteens	PCB-ARCH0064857
915	4/3/1972	"Guidelines for Handling and Disposal of Transformer-Grade Askarels," "First Draft - For ANSI C-107"	PCB-ARCH0241646
916	4/7/1972	Cumming Paton, Product Manager, fluids to Thompson farms, Co., Chicago, IL	PCB PCB-ARCH0090171
917	4/14/1972	Special Undertaking by Purchasers of Polychlorinated Biphenyls.	DSW 197983
918	4/20/1972	Davidson to Maddox "FRA 1129 (MCS 1129)	PCB-ARCH0011468
919	4/24/1972	P.W. Gann to C. Paton, "Therminol FR Conversion Project, Week of April	PCB-ARCH 0100594
920	4/28/1972	PCB'S Allowable Discharge from Producing/Using Plants Minutes of Meeting - 4/13/1972 in EPA Offices, Washington, D.C. by Paul B. Hodges	PCB-ARCH0739213
921	5/1/1972	Polychlorinated Biphenyls and the Environment-Interdepartmental Task Force on PCBs Report Washington D.C. May, 1972	DSW 010011
922	5/3/1972	Memo from J.N. Haggart to Cumming Paton re: Transformer Warning Plaque	PCB-ARCH0025006
923	5/5/1972	Memo from P.W. Gann to C. Paton re: Therminol FR Conversion Project Week of May 1, 1972	PCB-ARCH0172181
924	5/10/1972	Ltr from R. Emmet Kelly to Dr. J. Clarence Davies, III re: 27 workers engaged in the manufacture of polychlorinated biphenyls	HARTOLDMON0009897
925	5/14/1972	Washington Post "EPA Vows to Curb Discharge of PCB" by William Mead	PCB-ARCH0167254
926	5/15/1972	Presentation to the Interdepartmental Task Force on PCBs, Washington,	PCB-ARCH0026293
927	5/16/1972	Memo from Glynn Davis to J.W. Boehm re: PCB Contamination of POCL3	PCB-ARCH0268513
928	5/17/1972	Start - Up Manual for the Pydraul Reformulation Program by J.L. Solari	PCB-ARCH0091060
929	5/25/1972	Ltr from Cumming Paton to Customers re: Termination of offer to pay the freight costs incurred in returning Therminol FR to Monsanto for disposal	WATER_PCB-SPO00000024
930	6/2/1972	D. E. Roush to Norm Rustad, Quaker Oats, Company, Barrington, IL	PCB-ARCH0079216
931	6/3/1972	The Role of Polychlorinated Biphenyls in Electric Equipment	MONS 040035
932	6/9/1972	Ltr from Suttikus & Gunning to J.T. Bell re: report submitted to Mr. Eugene Wright on the fish residue data for our survey	DSW 013307
933	6/9/1972	Memo from P.G. Benignus to W.B. Papageorge re: PCB Pollution - Navigable Waters	PCB-ARCH0016251
934	6/14/1972	Memo W.R. Corey to H.S. Bergen re: PCB/PCT Phase Out Program	PCB-ARCH0098773
935	6/23/1972	Letter from Paul W. Gann to C.R. Jordan, Westinghouse Electric Corp. re: Incineration of dielectric fluids and disposal service	NEV 004900
936	6/23/1972	P.W. Gann to C. Paton, "Therminol FR Conversion Project, Week of June 19-23"	
937	6/30/1972	"Therminol FR Conversion Project, week of June 26 - 30, 1972	PCB-ARCH 0100546
938	7/5/1972	Monsanto letter to EPA re - termination of PCB manufacture in Anniston	DSW 010349
939	7/14/1972	Letter from Papageorge to Department of Health, Education and Welfare and Food and Drug Administration in response to PCB making their way into food supplies	PCB-ARCH0735189
940	7/17/1972	Memo from C. Paton to J.H. Davidson re: Food-Related Customers/Pydraul	MONS 098545
941	7/20/1972	Stewart, Krummrich, to Byrne, Purchasing, Queeny Plant (Company Confidential)	PCB-ARCH0267450 -PCB-ARCH0267451. (0259010-0259011)

Exhibit Number	Doc Date	Description	Beg Bates
942	7/21/1972	Ltr from J.J. Roder to Cumming Paton re: Call Report -Texaco's operation in Houston gave them an edict to change PCB material but refused to do	PCB-ARCH0494687
943	7/31/1972	E.E. Stewart, Technical Services Dept Krummrich Plant to Paul Heisler, Director of Environmental Control, Krummrich	PCB ARCH 0220806
944	8/8/1972	Functional Fluids Therminol Pydraul Santovac Sales Information Bulletin No. 89 re: Product Liability Company Confidential	PCB-ARCH0739360
945	8/23/1972	Letter re- special undertaking by Purchasers of PCB's	MONS 093941
946	8/29/1972	Brian Sullivan, "Tests in District, 18 States Show PCB in Human Tissue," <u>Washington DC Evening Star and Daily News</u> .	TOWOLDMON0059088
947	8/29/1972	Letter from Paul W. Gann to Robert Lowenstein re: phone conversation concerning incineration of Pyranol fluids, Monsanto PCB & non-Monsanto PCB fluids	WA TER_PCB-SPO00000004
948	9/1/1972	Report prepared by U.S. Dept. of Agriculture Ad Hoc Group on PCBs dated September 1972	DSW 188024
949	9/5/1972	The New York Times "Foods Still Carry a Toxic Chemical" by Boyce Rensberger	MONS 069776
950	9/7/1972	Hal Willard, "River Reveals High PCB Dose," Washington Post, Sept. 7, 1972, pp. F1, F7.	PCB-ARCH0567214
951	9/19/1972	Call Report, Organic Division, New Madrid Power Plant, New Madrid, Missouri.	PCB-ARCH0493778
952	9/20/1972	"PCB Is Discovered in 17 of 39 states," Washington <u>Post</u> , Sept. 20, 1972, p. B3	MONS069061
953	10/1/1972	Monsanto Memo - Keeping PCB's Out of the Environmental - a status report Wm. G. Drummrich Plant, Saug 10/1972, Illinois	PCB-ARCH0031708
954	10/5/1972	Ltr from Paul W. Gann to Robert Hollingaworth re: Discontinuing the use of Therminol FR fluids	WATER_PCB-SPO000000035
955	10/12/1972	Call Report from Koppers Co. to W.S. Clark re: Aroclor replacement work in swimming pool paints	PCB-ARCH0495881
956	10/17/1972	E.M. Potter, General Offices, to Papageorge, "PCB Pydrauls"	TOWOLDMON0056111
957	10/18/1972	Memo to Robert D. McClain to H. Wilbur Speicher re: 10/6/72 Letter	C000185
958	10/23/1972	Paul W. Gann, Project Coordinator, Heat Transfer fluids, to Mr. Tangerman, Molltool, Evansville, IN	PCB-ARCH0263341-4
959	10/24/1972	Bell to Richard	PCB- ARCH0007977
960	11/8/1972	D.E. Danzer, Engineering Achievements -1972 Environmental Protection Project	PCB- ARCH0171903 --PCB-ARCHO 171907 (0160352-0160353)
961	11/20/1972	A. Arpino, Brussels to C. Paton, St. Louis "Samples of PCB Dielectric	
962	11/22/1972	Letter from Paul W. Gann to J.L. Barnett Westinghouse Electric Corp., re:	NEV 004878
963	11/22/1972	Donald B. Stevens, Director, Bureau Water Quality Management, New York State Department of Environmental Conservation.	PCB-ARCH 0002184
964	11/27/1972	Memo from P.G. Benignus to H. S. Bergen,T. L. Gossage, N. T. Johnson, R. H. Munch, W. B. Papageorge, C. Paton, W. R. Richard, J. R. Savage re: Transformer Inerteen	PCB-ARCH0096858
965	12/1/1972	Minutes of Meeting, December 1, 1972, Purpose: MICC-MCL Information Exchange	MONS 202092
966	12/7/1972	Letter from Papageorge to Donald B. Stevens re: response ltr regarding concerns of PCB on the environment and implemented policies to change it. Enclosed list of PCB uses	GPFOX00049252
967	12/7/1972	Letter from W. N. Maddox to R. Laws re: Aroclor 1221 fluids - 6 pre-addressed drum return labels marked "Disposal Only"	LEXOLDMON001150

Exhibit Number	Doc Date	Description	Beg Bates
968	12/18/1972	Final Environmental Impact Statement Rule Making on Polychlorinated Biphenyls Food and Drug Administration Department of Health, Education, and Welfare by Sam D. Fine	PCB-ARCH-EXT0015798
969	1/1/1973	Long Range Plan: Dielectrics," 1973	MONS 040538
970	1/1/1973	Dielectrics - Report	PCB-ARCH0011734
971	1/1/1973	Long Range Plan Dielectrics Section VI	PCB-ARCH0109594
972	1/4/1973	Memo W.B. Papageorge to H.S. Bergen re: Environmental Impact Statement - PCB Rule Making	MONS 028657
973	1/8/1973	Ltr from Edward L. Raab to P.G. Benignus re: Askarel Dielectrics	PCB-ARCH0739840
974	1/25/1973	NEMA Official Standards Proposal - Proposed American National Standard Guidelines for Handling and Disposal of Capacitor - and Transformer-Grade Askarels Containing Polychlorinated Biphenyls, C107.1	NPC00018960
975	2/7/1973	Memo from K.A. Summerside to P.J.A. Marsh re: Aroclor & Pyroclor - Samples for Testing KAS/SW	PCB-ARCH0066629
976	2/22/1973	D.W. Stegon, to W.N. Slowikowski,	PCB-ARCH0495277
977	2/23/1973	Letter from Elmer P. Wheeler Manager, Environmental Health to Wilbur H. Speicher Administrator, Industrial Hygiene re: toxicity of chlorinated naphthalenes	MONS 092757
978	2/27/1973	Ltr from Gunning, Biological consultants letter to J.T. Bell, Monsanto	DSW 014596
979	3/1/1973	R. L. Bradley, Jr, "Polychlorinated Biphenyls in Man's food - A Review," <u>Journal of Milk Food Technology</u> , 36, 3 (1973), 155-162.	MONS085186
980	3/7/1973	McNeill Smith, attorney to Richard Stohr, Monsanto attorney re: Holly Farms v. Monsanto	
981	3/8/1973	Letter from Benignus to Papageorge re: Need for dry land fills for burial of askarel impregnated solid scrap materials.	ADM 007671
982	4/13/1973	Ltr from R.H. Munch to P.G. Benignus re: NEMA Procedure to Eliminate Environmental Hazard Posed by Askarel	PCB-ARCH0253341
983	5/2/1973	Ltr from Emmet Kelly to Donald Reed Sr. re: response to Reed's concern with headaches after inhalation of Interteen fumes	MONS 095152
984	5/2/1973	Ltr from Papageorge to A. Pozefsky and E.L. Raab re: Handling of askarels during emergency conditions due to askarel fluid in a transformer drained onto farmland.	NPC00020702
985	5/4/1973	Letter from W. B. Papageorge to Ms. Mary A. Appelhof	MONS 091681
986	5/23/1973	Ltr from Papageorge to Dr. C. Paton re: Scrap Aroclor Returns	PCB-ARCH0141113
987	6/15/1973	"GE Digs Its Way Our after Costly PCB Spill," <u>Electrical World</u> , p. 155	MONS069295
988	7/6/1973	Polychlorinated Biphenyls Contamination of Animal Feeds, foods, and food packaging materials and availability of supplement to Environmental Statement on Rulemaking	NCR-FOX-0573453
989	7/7/1973	FDA Curbs Chemicals in Feeds," <u>Washington Post</u> , July 7, 1973, p. A3	
990	7/13/1973	Letter from Papageorge to Martha Sager re Effluent Standards and Water Quality Information Advisory Committee Agenda and Notice of Public Hearings.	DSW 197344
991	7/16/1973	Statement by Monsanto Company for the Effluent Standards and Water Quality Information Advisory Committee, Environmental Protection Agency.	M09911
992	7/25/1973	G.F. Fague to C.F. Seger, "Glyco Chemical Co., Your 7-18-73 Letter"	PCB-ARCH0495963
993	7/30/1973	Cumming Paton, "FDA Proposals on PCBs"	PCB-ARCH 0046945
994	8/3/1973	Letter from W.N. Maddox to Pydraul Customers re: Removal of chlorinated compounds from Pydraul fluids	MCL002794

Exhibit Number	Doc Date	Description	Beg Bates
995	8/27/1973	Orville N. Mueth, Materials Handling Engineer, Monsanto, to A. E. Leisy, "Leaking Damaged Aroclor Containers"	PCB-ARCH0268896
996	9/10/1973	Papageorge to D. Paton, "PCBs – EPA Effluent Standards"	PCB-ARCH0044503
997	10/5/1973	Memo from A.J. Koenig to H.S. Bergen re: PCB/PCT Replacement Business 1969 vs 1973 on Reformulated Basis;	HARTOLDMON0000340
998	10/9/1973	Letter from C.F. Seger to Harold Wolf re: Letter from C.F. Seger to Harold Wolf re: skin irritation problems and possible solutions	NEV 006480
999	10/10/1973	Douglas Hansen to Erik Treffner, Monsanto, Canada, "Intalco Aluminum, Ferndale, WA	PCB-ARCH0003138
1000	10/11/1973	Letter from Papageorge to D.R. Hansen re: Intalco Aluminum Therminol FR-1 spill	WATER_PCB-SPO00000001
1001	11/14/1973	Memo from C. Paton to D. Zaretsky re: Canada/Dielectrics	PCB-ARCH0036039
1002	11/21/1973	Letter from James S. Nelson to Martha Sager re Effluent Limitations for Items on Toxic Substance List: Economic Impact of a Ban on PCB.	DSW 197283
1003	11/29/1973	Presentation to the Effluent Standards and Water Quality Information Advisory Committee, by Monsanto - Polychlorinated Biphenyl (PCB)	DSW 197369
1004	12/13/1973	H.A. Vodden, (Monsanto Eur) "Capacitor Askarels and the Environment,"	MONS062837
1005	1/4/1974	Memo from J.M. Wriston to R.M. Stovall re: Monthly PCB Status Report	PCB-ARCH0533871
1006	1/9/1974	American National Standard - (ANSI) Guidelines for handling and disposal of capacitor- and transformer-grade askarels containing polychlorinated biphenyls	NCP00018919
1007	1/15/1974	Letter from Gossage to ? - re PCB phase out	MCL003009
1008	1/18/1974	Letter from Papageorge to Hearing Clerk - USEPA re Proposed Toxic Pollutant Effluent Standards	DSW 179446
1009	2/8/1974	Letter from P.G. Benignus to C. Paton re: Transformer Pyranol	DSW 337956
1010	2/21/1974	PCB Loss Control Data Outline - WGK	PCB-ARCH0006884
1011	2/21/1974	Letter from Paul L. Wright to E.P. Wheeler re: PCB Effluent Standards	WATER_PCB-SPO00038394
1012	2/27/1974	Papageorge letter to Garrett re PCB Definition	DSW 174433
1013	2/28/1974	Minutes of Meeting on Proposed PCB Effluent Standards	TOWOLDMON0001385
1014	3/12/1974	Proposed Toxic Pollutant Effluent Standards for Aldrin-Dieldrin, Et Al - FWPCA (307) - Docket No. 1	TOWOLDMON0001385 - 1432
1015	3/25/1974	G. L. Johnson, Krummrich, to A. E. Leisy "Returned PCB Drums"	PCB-ARCH0513510 (0498753)
1016	3/26/1974	Benignus to Papageorge	PCB- ARCH0009608 (0010044)
1017	4/1/1974	Aroclor 1489 Product Strategy from C. Paton to T.L. Gossage, R.H. Munch, W.R. Richard, J.R. Savage, J.L. Wikoff	PCB-ARCH0534722
1018	6/18/1974	Memo from J.R. Savage to C. Paton re: Returned PCB - Westinghouse	PCB-ARCH0006855
1019	7/18/1974	Memo from David Wood to P.G. Benignus, Gossage, Papageorge, Paton, Richard re: Meeting 17th July Program Committee	PCB-ARCH0102018
1020	8/2/1974	E.L. Shirley to File re: McGraw Edison visit to St Louis.	PCB-ARCH0497229--PCB-ARCH0497230 (0470103-0470104)
1021	8/8/1974	Memo from Ron Lucas to W.B. Papageorge re: PCB Disposal	PCB-ARCH0037471
1022	9/16/1974	Memo from C. Paton to H.S. Bergen re: International Dielectrics Symposium, 9/23/1974 - Summary of pond experiment	PCB-ARCH0735278
1023	9/23/1974	Proposed Agenda and Paper Outlines Presented at the MICC Dielectrics Symposium Sept. 23, 1974	PCB-ARCH0735269
1024	9/27/1974	Letter from J. G. Bryant to D. Wood: Minutes of 'Safe Handling of PCB Fluids and Materials for Disposal of Waste Fluids' and 'Industrial Benefits of Polychlorinated Biphenyl Dielectric Fluids'	MONS 029193

Exhibit Number	Doc Date	Description	Beg Bates
1025	10/1/1974	Polychlorinated Biphenyls, Monsanto Company's program of restricted sales and controlled manufacturing practices, October 1974.	DSW 197865
1026	10/4/1974	Biological Consultants Ltr from Gerald E. Gunning to Edward E. Stewart, Monsanto Industrial Chemicals Co., W.G. Krummrich Plant re: consideration of the anomalous fishes	MONS 040344
1027	10/11/1974	Monsanto, "Press Query," - "Subject PCB Spill"	PCB ARCH 0518917
1028	10/15/1974	Letter - National Institute for Occupational Safety and Health to Emmet	DSW 019343
1029	10/16/1974	Memo from C. Paton to File re: McGraw-Edison/Returned Aroclor	PCB-ARCH0467253
1030	10/22/1974	Letter from D. Wood to Papageorge re: GE Transformer Spill	WATER_PCB-SPO00000003
1031	10/23/1974	Memo from D.B. Hosmer to P.E. Heisler re: Pesticides in compost degradation of PCB's during composting	PCB-ARCH0457730
1032	11/12/1974	Robert A Squire, Head, Tumor Pathology Section, NCI to Kimbrough, Toxicology Section, CDC	MONS092689
1033	11/22/1974	Handwritten ltr from Bill E. to Paul Heioler re: NIOSH Visit to Aroclor Dept.	MONS 030263
1034	11/25/1974	Memo from D. Wood to J. Savage re: PCB Action Plans	PCB-ARCH0741006
1035	12/9/1974	Memo from Papageorge re PCBs - Minutes of Meeting with NIOSH - 11/22/74	DSW 197822 DSW 197894
1036	12/23/1974	E. E. Stewart to Dave Wood, General Offices, "PCB Spill, H.K. Ferguson"	PCB-ARCH0220648 (0210054)
1037	1/1/1975	Total PCBs landfill at Anniston & Sauget	MONS 049347
1038	1/9/1975	Paul L. Wright to several, "MCA Toxic Substances Control Group Committee	PCB-ARCH0731369
1039	1/31/1975	George J. Levinkas: Aroclor 1260 -- Meeting at NCI, January 31, 1975	MONS 046518; STLCOPCB4070654
1040	2/3/1975	Letter from Ward R. Richter, D.V.M. to Dr. Donovan Gordon	MONS 095602
1041	2/4/1975	George J. Levinkas, "Aroclor 1260: Meeting at NCI, January 1975"	PCB-ARCH0170080
1042	2/10/1975	Memo from Papageorge to H. S. Bergen re Aroclor 1260 - HEW Studies	DSW 174830
1043	2/18/1975	Ltr from E.E. Stewart to W.B. Papageorge re: PCB - EIA "Ad Hoc	MONS 030224
1044	2/28/1975	Memo from L.P. Mieure to W. B. Papageorge re: Bioaccumulation of Aroclor Products	PCB-ARCH0249926
1045	3/3/1975	Company Confidential 1975 Manufacturing Improvement Plan for Aroclors and Pyranols Departments 246 and 259	MONS 055819
1046	3/10/1975	Memo from Papageorge to A.A. Johnson re: Pydraul - 1975 Goals/Action Plans	PCB-ARCH0004367
1047	3/18/1975	Letter from Papageorge to Dan A. Albert re - response to questions listed in letter dated 2/3/75	MONS 100142
1048	3/24/1975	"Report to Monsanto Company, Two-Year Chronic Oral Toxicity Study with Aroclor 1260 in Albino Rats," IBT	HARTOLDMON0015614
1049	3/24/1975	Industrial Bio-Test Laboratories, Inc. Reports Two-Year Chronic Oral Toxicity Study with Aroclor 1242 in Albino Rats	MONS 095019
1050	4/18/1975	Letter from J. C. Calandra to Dr. George Roush, Jr. re: J. C. personal view on PCB meeting	TOWOLDMON0001414
1051	5/29/1975	Memo from David Wood to C. Paton, J.R. Savage, E.M. Potter, W.B. Papageorge, R.C. Sprague re: PCB Incineration	PCB-ARCH0255815
1052	5/30/1975	Memo from H. S. Bergen to Papageorge re EIA Draft - Proposed PCB Position Letter to EPA.	DSW 196539
1053	6/5/1975	Letter to Robert A. Emmett from W.B. Papageorge re: Production and Sales of PCBs, Polychlorinated terphenyls and degradation infor relating to PCBs	HARTOLDMON0000336
1054	6/17/1975	D. Wood to Papageorge, "Westinghouse - Inerteen 100-42 spill"	PCB-ARCH0463404

Exhibit Number	Doc Date	Description	Beg Bates
1055	6/20/1975	Memo from D. Wood to W. B. Papageorge re: Intereen Leakage/Westinghouse-Detroit	PCB-ARCH0066869
1056	7/9/1975	Letter from W. B. Papageorge to R. G. Potter: MBR - Profit Contribution Product Acceptability First Half 1975	MONS 200031
1057	7/14/1975	Ltr from David Wood to J. Buchanan re: Production Trade and Use of PCBs supplied to OECD	PCB-ARCH-EXT0016579
1058	7/18/1975	George J Levinskas, Mgr, Environmental Assessment and Toxicology to J.C. Calandra, IBT	PCB-ARCH0568880
1059	7/23/1975	From the desk of Howard S. Bergen to TL Gossage, AJ Koenig, Papageorge, Richard, Savage re: PCB Contingency Plan	MONS 058529
1060	7/23/1975	Memo from H.A. Vodden to J.W. Barrett re: PCB - OECD	PCB-ARCH-EXT0016585
1061	7/25/1975	Letter from W.B Papageorge to PCB Ad Hoc Committee re: Thomas Kopp, Office of Toxic Substances, EPA call	NCP00025937
1062	7/28/1975	Bergen to F.J. Fitzgerald, "Your Memo July 1, 1975" "Personal and Confidential"	PCB ARCH0439973
1063	7/29/1975	Memo from W.B. Papageorge to H.S. Bergen re: Memo HSB to FJF, 7/17/1975 with attachment Draft Environmental Presence Polychlorinated Biphenyls	WATER_PCB-SD0000078536
1064	8/4/1975	Letter from J. C. Calandra to Dr. George J. Levinskas, Manager re: Aroclor - 2 Year Rat Studies	TOWOLDMON0001423
1065	8/6/1975	Memo from H.S. Bergen to J.R. Durland - Tokyo re: 1/7 Pydraul Market & 1/12 Aroclor Environmental Program Memos	PCB-ARCH0740889
1066	8/8/1975	Memo from H. S. Bergen re PCB Contingency Plan - Personal & Confidential.	DSW 185307
1067	8/8/1975	State Says Some Striped Bass and Salmon Pose a Toxic Peril by Richard Severo Page One, The New York Times	PCB-ARCH0740900
1068	8/9/1975	Warning Ignored on Striped Bass - The New York Times by Richard Severo	PCB-ARCH0740905
1069	8/13/1975	Letter from W.B. Papageorge to PCB Ad Hoc Committee re: Russell Train, EPA press statement on industry's intentions to control release of PCBs into the environment	NCP00025933
1070	8/13/1975	Mr. Ford, Monsanto to E. J. Wershey Carolina Capacitor, Inc.	PCB-ARCH0465261; PCB-ARCH0465259; (0437237)
1071	8/17/1975	The New York Times "Reports of Chemical in Fish Initially Withheld" by Richard Severo	PCB-ARCH043014
1072	8/18/1975	Memo from David Wood to W.B. Papageorge re: Ashland Chemical Company PCB Spill	PCB-ARCH0066745
1073	8/25/1975	Letter from W. B. Papageorge to H. S. Bergen re PCBs	MONS 028678
1074	8/25/1975	Food and Chemical News, PCB's in Fish Still a Problem, Report to EPA and Draft Memo Say	PCB-ARCH0114723 (0118960)
1075	8/28/1975	Public hearing to review and receive public content upon proposed administrative rules relating to the discharge of PCB's into the matters of the state	NCR-FOX-0096936
1076	8/28/1975	Continuation of - Public Hearing to Review and Receive Public Comment Upon Proposed Administrative Rules Relating to the Discharge of PCB's	NCR-FOX-0281414
1077	9/1/1975	David R. Young, Deidre J McDermott and Theadore C. Heesen, "Polychlorinated Biphenyls off Southern California," Paper presented at the	PCB-ARCH0037726
1078	9/3/1975	Memo from Fitzgerald to H.H. Bible re: PCBs - Kimbrough preliminary report on carcinogenic results in exaggerated tests involving PCBs	PCB-ARCH0740945

Exhibit Number	Doc Date	Description	Beg Bates
1079	9/14/1975	Polychlorinated Biphenyls Off Southern California by David R. Young	PCB-ARCH0037726
1080	9/26/1975	Papageorge, "PCB Review"	PCB-ARCH0004749
1081	9/30/1975	Ltr from Overholt Robert M. to Foster Arnette re: George Lee Galyon;	PCB-ARCH0740974
1082	10/1/1975	Levinkas to Gossage et al. "PCB Review"	PCB-ARCH06207 55 (0618655)
1083	10/10/1975	Wall Street Journal Article, Persistent PCBs Industrial Pollutants May be Worse Threat than DDT to Ecology by Jeffrey A. Tannenraum	MONS 032213
1084	10/17/1975	Statement of Dr. John L. Buckley, Office of Research and development Environmental Protection Agency before the Subcommittee on the Environmental Committee on Commerce US Senate, October 21, 1975.	DSW 194964
1085	10/17/1975	Ltr Memo from Fitzgerald to J.E. McKee, Jr.	PCB-ARCH0740984
1086	10/17/1975	Ltr from Stanley W. Legro, EPA to Monsanto re: Finding the source and amounts of PCBs entering the environment.	TOWOLDMON0001424
1087	10/21/1975	Memo from D.R. Bishop to F.J. Fitzgerald re: Confidential - Getting out of the PCB business	MONS 030829
1088	10/21/1975	James E. McKee to Fitzgerald, "Confidential"	PCB-ARCH 0246433
1089	10/25/1975	Morton Mintz, "Toxic Agents Polluting Environment," Washington <u>Post</u> , Oct. 25, 1975	MONS 032507
1090	10/28/1975	Memo for the Record - Subject: FJF Views on PCB's	MONS 030571
1091	10/28/1975	Memo from George Roush Jr. to W.B. Papageorge re: PCB- Mobil	MONS 030586
1092	10/29/1975	Memo from Fitzgerald to E.H. Harbison, Jr. re: PCBs	PCB-ARCH0740993
1093	10/29/1975	Monsanto Call Report From re: To determine General Electric's attitudes toward PCB and non PCB products	TOWOLDMON0057697
1094	11/3/1975	Monsanto Company Organizational Chart 11/3/1975	STLCOPCB0001252
1095	11/13/1975	Monsanto PCB Position Paper	MONS 046904
1096	11/17/1975	PCB's Made 65 Sick, General Electric Says, Chemical Marketing Reporter	PCB-ARCH0115920
1097	11/19/1975	D.R. Bishop Public Relations Press Release - Scientific report does not	MONS 058036
1098	11/20/1975	Memo from G.J. Levinkas advising to destroy news release by Dan Bishop & memo of 11-17-75.	DSW 165558
1099	11/20/1975	The New York Times article, E.P.A. Aide Wars of Tonic Leakage by Richard Severo	MONS 032595
1100	11/21/1975	Richard Severo, "Chemical Threat Held Widespread," New York <u>Times</u> , Nov. 21, 1975, p. 24	MONS033467
1101	11/22/1975	The New York Times article, Interior Aide Urges Curbs on Use of PCB Chemical	MONS 033412
1102	11/24/1975	Emergency Plan - PCBs	PCB-ARCH0741008
1103	11/29/1975	"F.D.A. Weighs a Cut in the Limit of PCB It Allows in Fish," New York Times, Nov. 29, 1975, p. 31	
1104	12/1/1975	The Spreading Menace of PCB by Robert H. Boyle, Sports Illustrated	WATER_PCB-00042872
1105	12/3/1975	The Wall Street Journal "Dow Chemical to Sell Substitute for PCBs in Power Capacitors"	PCB-ARCH0521449
1106	12/5/1975	Ltr from Papageorge to Richard L. Rollins re: Disposal methods of solid waste containing PCBs	PCB-ARCH0004566
1107	12/10/1975	Report by PCB Study Group	MONS 029380
1108	12/11/1975	Ltr from Papageorge to Earl J. Stephenson re: response to questionnaires which accompanied Stanley Legro's letter dated 10/17/1975	TOWOLDMON0003968
1109	12/12/1975	Francis Ward, "Health Hazard from PCBs Seen Rising," Los Angeles <u>Times</u> , Dec. 12, 1975, p. K1	
1110	12/22/1975	Train letter to Hanly, dated 12/22/75	DSW 012433

Exhibit Number	Doc Date	Description	Beg Bates
1111	12/22/1975	Letter from D.R. Bishop to R.E. Beal, O.P. DeGarmo, W.C. Hammann, E.H. Harbison, W.B. Papageorge, C. Paton, R.A. Pohl re: EPA/PCB Press Conference	MONS 030281
1112	12/22/1975	[Press Release?] "EPA Administrator Urges End to Use of Certain Industrial Pollutants"	MONS070160
1113	12/22/1975	Attachment 3 - Background Statement by Environmental Protection Agency Administrator, Russell E. Train at a press conference on PCB's	PCB-ARCH0246804
1114	12/22/1975	Report by PCB Study Group by F.J. Fitzgerald	PCB-ARCH0741027
1115	12/22/1975	Monsanto Press Release - Monsanto to Produce New Capacitor Fluid as PCB Replacement - Dielectric Insulating Fluid, code named MCS 1238	STLCOPCB4044924; MONS060516
1116	12/23/1975	The Wall Street Journal Article Halt to Using PCB Chemicals Sought by EPA	MONS 032599
1117	12/23/1975	Memo from R.L. Sandstedt to J.R. Middleton re: Comments on Letter to G.L. Bratsch From C.P. Orr	PCB-ARCH0021927
1118	12/23/1975	Casey Bukro, "EPA Urges End to PCB Poisons," <u>Chicago Tribune</u> , Dec. 23, 1975, p. 12	
1119	1/1/1976	"EPA Curbs PCBs, Moves Towards Ban," <u>ChemEcology</u> , published by MCA	MONS031829
1120	1/1/1976	"Item 5" - "PCB material for disposal has two sources - Monsanto production plant generated waste and customer returns.	
1121	1/5/1976	W.G. Krummrich Discharge PCB Status	PCB-ARCH0115883
1122	1/12/1976	Minutes C-107 Capacitor Subcommittee Notes	MONS 029601
1123	1/12/1976	Minutes of PCB AD HOC Committee Meeting held Jan. 7 & 8, 1976 in Washington D.C	NPC00021043
1124	1/12/1976	ANSI Committee, C107, on Use and Disposal of Askarel and Askarel-Soaked Materials	PCB-ARCH0233536
1125	1/17/1976	EPA Acts on PCB's, Pesticides. <i>Science News</i> , 109 (Jan 17, 1976), 40.	No Bates
1126	1/26/1976	Letter from Mike Petrilli to Distribution List attached re: Enclosed copy of remarks made by Jack Fitzgerald, at EPA meeting Jan. 14, 1976	MCL 003071
1127	1/27/1976	The New York Times "Phase-out is Set of PCBs Chemical	PCB-ARCH0216715
1128	1/27/1976	Wall Street Journal, "Monsanto to Eliminate PCB Fluid Production	PCB-ARCH0216978
1129	2/1/1976	Monsanto Change of Employee Status and Information Sheet for Paul L. Wright, Toxicology	WATER_PCB-00038620
1130	2/18/1976	D. R. Bishop to Paton and Sliney, "WCBS TV NY Editorial"	PCB-ARCH0537563
1131	2/18/1976	Ltr from John R. Zagame to W.B. Papageorge re: Legislation concerning PCB's	PCB-ARCH0741080
1132	2/18/1976	J. Weber to John Lehman, EPA, February 18, 1976, Attachment: "Recommended Procedures for the Disposal of PCB-Containing Wastes	STLCOPCB4002375
1133	3/1/1976	National Conference on Polychlorinated Biphenyls - EPA, November 19-21, 1975, Chicago, Illinois	MONS 063655
1134	3/4/1976	Levinskas, "Achievement Award Data Sheet for Paul L. Wright, Toxicology Manager	
1135	3/24/1976	Toxicity Studies with PCB in Primates	MONS 030587
1136	3/24/1976	Paul L. Wright to George Roush, Jr "Toxicity Studies with PCB in Primates"	MONS031511
1137	3/26/1976	Cartoon, in St. Louis Post-Dispatch	TOWOLDMON0056851
1138	4/13/1976	Memo from D.M. Sauter to F. Bean, J. Brittain, R. Sawyer, R. Wills, B. Kerns, J. Aldworth, J. Lovett re: Meeting with Department of Commerce	NPC00006497
1139	4/21/1976	Memo from David Wood to PCB Spill file re: National Steel Research	PCB-ARCH0066787

Exhibit Number	Doc Date	Description	Beg Bates
1140	4/22/1976	L.M. Schmidt Du Pont of Canada to Westinghouse Canada Limited	PCBARCH 0569031
1141	4/27/1976	Statement on Legislation Regarding Polychlorinated Biphenyls on Behalf of Electrical Utilities Company, LA Sale, Illinois and Electronic Industries Association, Washington D.C. to House Committee on Environment, Energy, and Natural Resources of the Illinois General Assembly	PCB-ARCH0070840
1142	5/1/1976	Dielectrics Business Direction Report	PCB-ARCH0022223
1143	5/6/1976	Letter from Slowikowski to group - RE Recent EPA (PCB) Letters to Pydraul, Therminol Customers	MONS 028944
1144	5/13/1976	Message from J.C. Webber re: Update on PCB replacement products, and phase-out timetable.	E000542
1145	6/28/1976	Memo from A.E. Leisy to R.A. Pohl re: PCB Disposal	PCB-ARCH0270545
1146	7/1/1976	Final Report of the Subcommittee on the Health Effects of Polychlorinated Biphenyls and Polybrominated Biphenyls, July 1976	MONS 056209
1147	7/16/1976	Evaluation of Paul Wright	WATER_PCB-00038620
1148	7/29/1976	Applied Sciences Report - Biodegradability of Dielectric Fluids and Components	MONS 064600
1149	8/1/1976	Polychlorinated Biphenyls A Risk/Benefit Dilemma Monsanto Company	PCB-ARCH0030437
1150	8/28/1976	Victor Cohn, Mother's Milk in 10 States found to Contain Toxic chemical PCB," Washington Post, pp. A1, A6.	PCB-ARCH0438119
1151	9/2/1976	News Release Preliminary Information from Ongoing PCB Study Released by Monsanto D.R. Bishop	PCB-ARCH0545996
1152	9/8/1976	"Closer Look at PCBs," <u>Chemical Week</u>	PCB-ARCH0520757
1153	9/10/1976	Environmental News Press Release: PCBs Reported in Milk of Nursing Mothers	PCB-ARCH0228804
1154	9/24/1976	Memo from C.R. Wilmore to All Members of ANSI Committee C-107 on use and Disposal of Askarel and Askarel-Soaked Materials in Electrical Equipment; Subject Letter Ballot on Approval of Revision of ANSI Publication C-107	PCB-ARCH0741261
1155	9/24/1976	PCB Q&A approved by Peter W. Whippy	PCB-ARCH-EXT0017483
1156	9/29/1976	Ltr from D.R. Bishop to J.D. Carr re: Attached PCB Q&A statement	MONS 030378
1157	9/30/1976	Bishop to several (including F.J. Fitzgerald, "PCB News Release")	PCB-ARCH0729821
1158	10/4/1976	Letter from R.G. Potter to C.F. Malm re: Monsanto will cease manufacture	WATER_PCB-SPO00000360
1159	10/11/1976	Public Law 94 -469 94th Congress 90 STAT. 2003; Toxic Substances Control Act. 15 USC 20601 note.	PCB-ARCH0220458
1160	11/16/1976	Mailgram Service Center re: ITE Transformers developed a leak and dumped several gallons of Pyrenol Coolant on the equipment room floor	PCB-ARCH0066754
1161	11/24/1976	Memo from D. Wood to File re: Meeting with General Electric Schenectady - 11/10/1976	PCB-ARCH0461834
1162	12/17/1976	St. Louis, Monsanto Company said today that effective Jan. 1, 1977, it will increase the price of all grades of its polychlorinated biphenyl (PCB) dielectric insulating fluids by about 24 per cent	TOWOLDMON0001455
1163	12/30/1976	Ltr from James A. Alley to Mr. Dennis Ibrahim re: preparation of Monsanto's withdrawal as a supplier of PCBs as of 10/31/1977	PCB-ARCH0464912
1164	1/1/1977	Letter from James A. Alley to Customers re: Discontinue accepting PCB waste & Incineration facilities June/July 1977	ADM 002421
1165	2/28/1977	Ltr from James A. Alley to Edward W. Feuerstein re: review of Askarel purchase agreement	PCB-ARCH0086395
1166	3/1/1977	Alley to Wood G.E. Schenectady Meeting on Service Shop Requirements February 24, 1977.	PCB-ARCH0461757 (0433700)

Exhibit Number	Doc Date	Description	Beg Bates
1167	3/2/1977	Memo from David Wood to C. Paton re: G.E. Schenectady wish to retain an ability to repair PCB filled transformers for two and years	PCB-ARCH0461746
1168	3/2/1977	Memo from David Wood to C. Paton re; G. E. Schenectady	TOWOLDMON0057706
1169	3/10/1977	Memo from D. Wood to F.J. Fitzgerald re: Bokaro Steel - India Transformers Dielectrics with Draft Letter attachment	PCB-ARCH0087560
1170	4/12/1977	Memo from J.G. DePagter to W.W. Perdue re: Disposal of Spare Pyranol (PCB) Filled Furnace Transformer	PCB-ARCH0551540
1171	4/19/1977	PCB Position Statement At 1977 Annual Meeting	MONS 001880
1172	4/20/1977	Janes A. Alley, general Offices, to File, "Monsanto PCB Tankcar MONX8601 Leaking at Binghamton, New York	PCB-ARCH0147550
1173	5/1/1977	EPA PCB Marking and Disposal Regulations Support Document 40 CFR Part 761	
1174	5/13/1977	Memo from J.A. Alley to D. Wood re: Recommendation on stopping customer returns of PCB waste to the W.G. Krummrich incinerator	PCB-ARCH0270558
1175	5/13/1977	Memo from J.A. Alley to D. Wood re: Recommendation on stopping customer returns of PCB waste to the W.G. Krummrich incinerator	PCB-ARCH0270558
1176	5/25/1977	Memo from K. Warren Easley to John Hussey re: EPA proposed regulation on the labeling and disposal of PCBs	PCB-ARCH0147424
1177	7/20/1977	Waste Disposal Agreement	PCB-ARCH0741602
1178	10/5/1977	Bishop, Press Release, "Monsanto to Shut Down PCB Unit, Exit Business by Oct. 31, 1977"	PCB-ARCH0218050
1179	10/5/1977	Monsanto Press Release - Monsanto to shut down PCB Unit, Exit Business by Oct. 31, 1977	PCB-ARCH-EXT0017464
1180	10/31/1977	G.F. Barton, Public Relations, Press Release	PCB-ARCH0518302
1181	11/3/1977	PCB Facilities Decontamination and Dismantlement program	PCB-ARCH0147417
1182	11/4/1977	Questions and Answers to be Used Only to Respond to Direct Questions from the Media 2nd Draft	PCB-ARCH0735588
1183	11/9/1977	E. T. Mollica to L.A. Miller, "PCB Phase-out"	PCB-ARCH0147416
1184	11/10/1977	Memo from E.T. Mollica to F.J. Fitzgerald re: PCB clean up	PCB-ARCH0066403
1185	11/28/1977	Letter from Wilkins to Nolan dated 11-28-77	DSW 266487
1186	12/2/1977	Memo from J. Coleman Weber to E.T. Mollica re: PCB Spills	PCB-ARCH0066747
1187	12/19/1977	Monsanto Radio Broadcast with KMOX Radio Station transcript	MONS 000403
1188	1/1/1978	National Cancer Institute Carcinogenesis Technical Report Series No. 38 1978 - Bioassay of Aroclor 1254 for Possible Carcinogenicity CAS No. 27323-18-8 NCI-CG-TR-3S	PCB-ARCH0147620
1189	1/3/1978	Memo from James M. Wriston, Jr. to L.L. Dearing re: Monthly Incinerator Status Report	PCB-ARCH0450243
1190	4/21/1978	National Institutes of Health, Press Release	PCB-ARCH0025963
1191	5/11/1978	Memo from R.L. Liss & J.R. Condray to H.W. Barber, G.F. Benjamin etc: EPA Manual for Enforcement of PCB Regulations	PCB-ARCH0741749
1192	5/19/1978	R.C. Isham (PR, Monsanto) to P. E. Berteau (Med and Env Health)	PCB-ARCH0438257
1193	5/30/1978	Peter Berteau to R.C. Isham	
1194	6/2/1978	Review of Aroclor report about possible carcinogenicity	MONS 002684
1195	8/16/1978	Sue Reinert, "Alcan is on DEC Survey for Storing PCBs at Plant," Oswego Valley News.	PCB-ARCH0438767
1196	11/15/1978	"PCB Leak Contaminated Truck, Cargo," St. Louis Globe-Democrat.	PCB-ARCH0537991

Exhibit Number	Doc Date	Description	Beg Bates
1197	1/11/1979	Lucille C. Henschel, Acting Project Manager, Vinyl Chloride Research, MCA, to Vinyl Chloride Audit Task Group, Jan 11, 1979, cited in Gerald Markowitz and David Rosner, <i>Deceit and Denial: The Deadly Politics of Industrial Pollution</i> , (University of California Press/Milbank, 2002), p. 215.	
1198	1/28/1979	Lenox Rawlings, "N. Carolina: Chemicals on State Highways A Political Headache for Hunt," <u>The Atlanta Journal and Constitution</u> , p. 12-C	PCB-ARCH0438039
1199	5/31/1979	EPA - Polychlorinated Biphenyls; Criteria Modification Hearings	MONS 007578
1200	8/2/1979	Max W. McCombs, Monsanto Queeny Plant to Night Superintendents	PCB- ARCH0090708
1201	9/11/1979	Toxic Chemical, Born of PCBs, Found by Bill Richards	MONS 201592
1202	9/17/1979	Memo from R.L. Liss to E.J. Young re: PCB Disposal EJY to RLL-9/12/1979	PCB-ARCH0605768
1203	9/27/1979	PCB Disposal	MONS 003037
1204	10/2/1979	"PCB Contamination Indicated in Number of Western States," <u>Journal of Commerce</u>	MONS008896
1205	10/25/1979	Ltr from Roger L. Williams to J.W. Hanley re: Seventeen drums of a Monsanto product, Therminol FR-1 (polychlorinated biphenyl Aroclor 1242) stored on a farm near Lafayette, Colorado	PCB-ARCH0741981
1206	10/29/1979	Memo from G. L. Jessee to M. C. Throdahl re Legal vs. Social Responsibility - Abandoned/Orphan Waste Disposal Sites.	MCO6502553
1207	11/1/1979	Alex Krislov, "PCB – Power Transmission's Invisible Menace," <u>PTD</u> , pp. 41-43	MONS000695
1208	11/3/1979	Mike Sager, "Complaints Spur PCB Investigation in U.S. Buildings," <u>Washington Post</u> .	PCB-ARCH0561109
1209	11/16/1979	Monsanto Company, Submission to the Subcommittee on Oversight and Investigations of the Committee on Interstate and Foreign Commerce, U. S. House of Representatives	MONS 010394
1210	11/29/1979	Jack Jones and H. Alden, "An Acneform Dermatogosis," <u>Archive of Dermatology and Syphiology</u> , 33 (1936), 1023-1027	DSW 254938
1211	12/1/1979	USEPA document titled "Polychlorinated Biphenyls: An Alert For Feed & Feed Facilities"	MONS 000205
1212	12/3/1979	Ltr from R.L. Williams to J.W. Hanley re: PCB disposal problem on the farm near Lafayette, CO	PCB-ARCH0741990
1213	12/6/1979	Ltr from Dan R. Bishop to Mr. H.L. Stevenson re: PCBs repeatedly refer to them as "cancer-causing" agents	MONS000803
1214	12/12/1979	Page from Toxic Material News, Dec. 12, 1979, on "CBE Suggests Administration Purposely Delayed Hazardous Water Rules", "PCB Landfill Disposal Facilities Listed by EPA"	TOWOLDMON0058727
1215	1/1/1980	Handwritten notes re: myth of PCBs causing cancer	MONS003884
1216	3/27/1980	Ltr from Dan R. Bishop to James Ellis re: PCB White Paper	MONS 003875
1217	4/29/1980	Trip Report by Peter E. Berteau on 4/29/1980 visited Litton-Bionetics, Kensington, Maryland re: To discuss needed revisions on the draft report on the effects of PCB on the reproductive performance of the rhesus monkey	PCB-ARCH0574949
1218	5/10/1980	West B. Associates, Inc., Confidential and privileged review and audit of IBT". May 10, 1980, cited in Markowitz and Rosner, <i>Deceit and Denial</i> , p. 215.	
1219	6/1/1980	Polychlorinated Biphenyls, PCB's, A Report on Uses, Environmental and Health Effects and Disposal, 1979	MONS 061333

Exhibit Number	Doc Date	Description	Beg Bates
1220	6/1/1980	Listing of EPA approved chemical waste landfills for polychlorinated biphenyl (PCB) disposal from John H. Craddock	PCB-ARCH-EXT0020549
1221	8/29/1980	Ltr from Peter E. Berteau to David P. Martin D.V.M. Littlon Bionetics re: BO-77-2 Effects of PCB on the reproductive performance of the rhesus	MONS 002994
1222	9/19/1980	WGK Today Monsanto Company Dial STA. 2022 Comment & Answer Employee of almost 10 years in the Aroclor Dept. Krummrich plant concern about his health due to newspapers describing PCB's as cancer-causing agents and deadly toxins	MONS 000716
1223	9/23/1980	"Note to Editors from Monsanto Company, PCB Hazard – Fact and Fallacies," September 23, 1980	MONS 019338
1224	9/26/1980	Repeated in Bishop, "PCB Hazards – Facts & Fallacies"	PCB-ARCH0148758
1225	10/3/1980	Letter from Dan R. Bishop to OpUnit PR Directors re: PCBs	MONS 003860
1226	2/10/1981	Memo from Donald L. Coleman, M.D. to File re: Binghamton Transformer Fire Feb. 4, 1981	MONS 002995
1227	2/14/1981	Binghamton fire article; Displaced worker say inconvenience is better than return to quarters by Lisa Getter	MONS 010609
1228	3/2/1981	Marcia Cohen, "PCB Mishap Leaves Uneasiness," <u>Detroit Free Press</u> ,	PCB-ARCH0684303
1229	3/3/1981	Memo from John H. Craddock to R.S. Nelson re: February Monthly Report	PCB-ARCH0650797
1230	4/1/1981	P. Gene Herbert, Corporate Environmental Specialist High Voltage Maintenance Corp, Dayton, OH , "PCB Regulation Update"	PCB ARCH 0498087
1231	4/2/1981	Memo from J.H. Craddock to R.S. Nelson re: March Monthly Report	PCB-ARCH0683888
1232	5/3/1981	Plan Still Sought for Binghamton Tower Cleanup by Richard D. Lyons, New York Times	NEV 035059
1233	5/5/1981	Memo from J.H. Craddock to R.S. Nelson re: April Monthly Report	PCB-ARCH0650773
1234	11/4/1981	Ltr memo J.H. Craddock to R.S. Nelson re: October Monthly Report (redacted)	PCB-ARCH0683207
1235	1/7/1982	Memo J.H. Craddock to R.S. Nelson re: December Monthly Report; PCB Surveillance Program	PCB-ARCH0685087
1236	3/13/1982	Jane Norman, "PCB: Overhead Hazard," <u>Des Moines Tribune</u> , p. 1.	PCB-ARCH-EXT0038389
1237	9/12/1982	American Chemical Society's 184th National Meeting Kansas City, Missouri Sept. 12-17, 1982	NEV 035066
1238	1/1/1983	Polychlorinated Biphenyls Production, Current Use and Possible Rates of Future Disposal in OECD Member Countries, by J.D. Bletchly	PCB-ARCH-EXT0016689
1239	4/1/1983	The Rollins Environmental Services, Inc. Report; PCB: Pollution, Politics and Prevention by Steven Jellinek, April 1983	MONS 212534
1240	5/27/1983	R.W. Berry, Monsanto to Davis Woo, "Transformer Cooling Fluids."	PCB-ARCH0565888
1241	9/23/1983	U.S. Can Expect 1,120 Transformers Fires Each Year, Finnish Scientist Tells NIEHS by Research Triangle Park, N.C.; Current Report Chemical Regulation Reporter	PCB-ARCH-EXT0056066
1242	2/1/1984	Recommendations for the Prevention of PCDF Contamination from Fires Involving Electrical Equipment by Commercial Chemicals Branch Environmental Protection Programs Directorate Environmental Protections Service Environment Canada	MONS 214026
1243	2/14/1984	Alan R. Schneider, "Memo to file, "Re: PCB Leak Report: Block 6S	PCB-ARCH-EXT 0039136
1244	3/23/1984	Federal Register Environmental Protection Agency Part III 40 CFR Part 761 Polychlorinated Biphenyls (PCBs); Manufacture, Processing, Distribution in Commerce and Use Prohibitions; Use in Electrical Transformers; Advanced Notice of Proposed Rulemaking; Vol. 49, No. 58	49 FR 11077

Exhibit Number	Doc Date	Description	Beg Bates
1245	3/23/1984	Comments of the Utility Solid Waste Activities Group, The Edison Electric Institute, the American Public Power Association and the National Rural Electric Cooperative Association in response to Advance Rulemaking Concerning Risks Posed by Fires Involving PCB-Containing Transformers 49 Fed. Reg. 11070	MONS 213857
1246	5/21/1984	Ltr from John H. Craddock to TSCA Public Information Office of Toxic Substances U.S. Environmental Protection Agency Room E-108	MONS 216084
1247	6/15/1984	PCB Technical Report from EPRI Number 8 - EPRI Technical Newsletter Electrical Systems Division; EPRI PCDF Projects	MONS 213959
1248	12/16/1984	Environmental Protection Agency Office of Pesticides and Toxic Substances 40 CFR Part 761 Polychlorinated Biphenyls in Electrical Transformers Reference Document Draft Report	PCB-ARCH0639755
1249	1/1/1985	Lessons Learned from the Transformer Fire at the Binghamton (NY) State Office Building by David Axelrod, M.O.	MONS 213731
1250	1/1/1985	Product & Environmental Safety Director Chart by John H. Craddock	PCB-ARCH-EXT0065259
1251	1/24/1985	Memo from J.H. Craddock to R.B. Phillips re: Gene Hohlfeld's performance and contributions to the PCB Issues Management Program	PCB-ARCH-EXT0065251
1252	7/8/1985	James M. Odato, "Families Uncertain of Future," The [Binghamton, NY] Evening Press, p. B1.	PCB-ARCH-EXT0055539
1253	7/16/1985	Memo from J.H. Craddock to R.B. Phillips re: E.F. Hohlfeld Achievement Recognition	PCB-ARCH-EXT0065107
1254	1/1/1986	U.S. EPA, region 10, Seattle, WA, "PCBs in Fluorescent Light Fixtures: A Fact Sheet"	PCB-ARCH-EXT0065064
1255	2/24/1986	NIOSH Current Intelligence Bulletin 45 Polychlorinated Biphenyls (PCB's) Potential Health Hazards from Electrical Equipment Fires or Failures	WATER_PCB-00052547
1256	4/1/1986	Kaplan SA. "Manual L-1," paper delivered at the 191st National Meeting of the American Chemical Society, New York, NY, April 1986 http://jrm.phys.ksu/safety/kaplan.html . Accessed 4 Dec 2014.	
1257	10/28/1991	Phillip Smith Trial Testimony for Glenn Brown v. Monsanto Case	
1258	4/8/1992	Monsanto Membership in Selected Organizations & fees paid - printed on 9/26/01	TOWOLDMON0013168
1259	6/10/2011	National Cancer Institute Formaldehyde and Cancer Risk	No Bates
1260	1/1/2013	David Rosner and Gerald Markowitz, "Persistent Pollutants: A Brief History of the Discovery of the Widespread Toxicity of Chlorinated Hydrocarbons," Environmental Research, 120(2013), 126-133	No Bates
1261	4/15/2013	The Washington Post Health & Science "Flame Retardants in Consumer Products are linked to Health and Cognitive Problems by Liza Gross	No Bates
1262	1/1/2014	Spears EG (2014). Baptized in PCBs: race, pollution, and justice in an all-American Town. University of North Carolina Press, Chapel Hill.	
1263	1/1/2016	IARC Monographs on the Evaluation of the Carcinogenic Risk to Humans; Polychlorinated Biphenyls and Polybrominated Biphenyls Vol. 107	No Bates
1264	1/1/2016	Educate the Individual . . . to a Sane Appreciation of the Risk" A History of Industry's Responsibility to Warn of Job Dangers Before the Occupational Safety and Health Administration by David Rosner, PhD, and Gerald Markowitz, PhD; AJPH Jan. 2016, Vol. 106, No. 1	
1265	12/23/2016	CDC - National Biomonitoring Program; Biomonitoring Summary - Non-Dioxin-Like Polychlorinated Biphenyls	No Bates
1266	11/10/1969	Handwritten profit and liability charts from Monsanto's PCB Environmental Pollution Abatement Plan filled out plus handwritten outline	MONS 035354

Exhibit Number	Doc Date	Description	Beg Bates
1267	11/13/1975 11/14/1975	"PCB Discussions; Governmental Agencies"	PCB-ARCH0250221
1268	No Date	PCB Trade Names, Uses, & Physical Properties Spreadsheet	HARTOLDMON0000335
1269	No Date	Biological and Environmental Reports and Studies Relating to PCBs and PCB Containing Products	HARTOLDMON0000747
1270	No Date	EPA Ban - U.S. Domestic Sales of PCBs by Grade (The uppermost curve represents the total sales) 1963 - 1980	HARTOLDOMON0004516
1271	No Date	U.S. Domestic Sales of PCBs by Grade (The uppermost curve represents the total sales) 1963 - 1979	HARTOLDOMON0004517
1272	No Date	Appendix I Polychlorinated Biphenyl Biodegradation Studies	MONS 042077
1273	No Date	The Handling of Aroclors	MONS 057354
1274	No Date	Very urgent telegram from D. Tucker in London, to Emmett Kelly, J Haggart's and PB Salter re: employee of Wellman international currently commissioning steelworks for it save aria in Bilbo a Spain is in hospital suffering from sickness and giddiness after exposure to hot vapor	MONS 071265
1275	No Date	New chemical traces from fire site found	NEV 035060
1276	No Date	Aroclors and Therminols Pollution Control	PCB-ARCH0005063
1277	No Date	Public Relations Dept. Press Query; PCB 9/28 Joe Boyce, Time Magazine; Casey Bukro, Chicago Tribune; Nancy Brumback Profile; Martin Barolsky, Journal of Commerce; Question & Answers	PCB-ARCH0045553
1278	No Date	Aroclor Long-Range Objectives	PCB-ARCH0055524
1279	No Date	Do's and Don'ts for Regional Managers	PCB-ARCH0227401
1280	No Date	Benjamin F. Jones and D.D. Donahue, US PHS, "Toxicity of Chlorinated Diphenyl: Preliminary Report, "for publication in Public Health Reports" "Arochlor File"	PCB-ARCH0569578
1281	No Date	Environmental Protection Agency Office of Pesticides and Toxic Substances 40 CFR Part 761 Polychlorinated Biphenyls in Electrical Transformers	PCB-ARCH0686104
1282	No Date	Ltr from Suzanne Rudzinski to Robert J. Fensterheim re: Request for clarification of the terms commercial building and industrial building as they appear in the July 17, 1985 PCB Transformer Fires Final Rule	PCB-ARCH0734783
1283	No Date	Development Program - Non-PCB Transformer Fluids	PCB-ARCH0742865
1284	No Date	Beware-Your Health is at Stake, Environmental Chemicals: Polychlorinated Biphenyls (PCBs) A brief exploration of the problem by James R. Allen, D.V.M., Ph.D.	PCB-ARCH-EXT0067195
1285	No Date	Monsanto Message to Ed. Fording from PLS subject Essex Chemical re: May of 1977 there people bought 12,000 of Aroclor 1242 from Monsanto and was shipped	TOWOLDMON0053293

EXHIBIT C

*David Rosner, PhD
Columbia University
Ronald H. Lauterstein Professor
of Sociomedical Sciences and
Professor of History
and
Co-Director,
Center for the History and Ethics of Public Health
Department of Sociomedical Sciences
Mailman School of Public Health
722 West 168th Street 9th Floor
New York, NY 10032*

Telephone: 212-305-1727 **Fax:** 212-342-1986

E-mail: dr289@columbia.edu

Other Positions: Adjunct Professor of Community Medicine, Mt. Sinai School of Medicine

Education:

B.A.	City College of New York	1968
M.S.	University of Massachusetts, Public Health	1972
Ph.D.	Harvard University History of Science	1978

Immediate Past Position:

University Distinguished Professor, City University of New York, 1996-1998.

Major Awards, Fellowships and Honors:

Elected Member: National Academy of Medicine, 2010.

National Science Foundation, “Toxicdocs,” Co-PI, 2018-2021, NSF- 15-506.

Rachel Carson Award, American Industrial Hygiene Association, May 23rd, 2018, Philadelphia.

“Outstanding Scholarship on the History of Work and Health,” International Commission on Occupational Health, Scientific Committee on the History of Prevention of Occupational and Environmental Disease, March 29, 2017.

Columbia-PSL Collaboration Grant, Paris, France, September 20-October 15, 2018.

John P. McGovern Science and Society Award, *Sigma Xi*, The Scientific Research

Society, 2014.

John Simon Guggenheim Fellow, 1987-88.

Fellow, New York Academy of History.

Congressional Certificate of Appreciation, from Senator Sheldon Whitehouse, 2017.

Upton Sinclair Prize, American Industrial Hygiene Association

Arthur Viseltear Award, American Public Health Association, Medical Care Section, 2000.

“Beyond the Call of Duty,” Annual Award, The Child Lead Action Project, 2010.

Presidential Excellence Award for Distinguished Scholarship, Baruch College/City University of New York, 1995.

Distinguished Alumnus Award, University of Massachusetts, School of Public Health

Faculty Mentoring Award, 2016, Department of Sociomedical Sciences, Mailman School of Public Health, Columbia University, 2016.

Faculty Mentoring Award, Mailman School of Public Health, Columbia University, 2017.

David Rogers Seminar, Weill-Cornell Medical Center, January 10, 2017.

Other Significant Grants, Fellowships and Honors

- | | |
|------|--|
| 2018 | Special Issue of Journal of Public Health Policy, Available at:
https://link.springer.com/journal/41271/39/1/page/1 , |
| 2015 | The Garrison Lecture, American Association for the History of Medicine, Annual Convention. New Haven. |
| 2014 | Annual Lecture: Disease on Trial: the Courts, the Lawsuit and the Public Negotiation over Responsibility for Disease, London, London School of Hygiene and Tropical Medicine, Centre for History in Public Health, Nov. 20. |
| 2014 | Keynote address: Reflections on a Century of Occupational Health and Safety History, OSH Section, Centennial Year Celebration, APHA Annual Convention, Nov 18. |
| 2014 | “Beyond the Call of Duty,” Annual Award, The Child Lead Action Project, Oct. 16. |
| 2014 | University of Maryland, Health Across the Borders Conference, “Sand, and Lead, Workers and Children: The Public Renegotiation of Responsibility, for Occupational and Environmental Damage in Late 20th Century America, Sept. |

19.

- 2014 Panelist, Congressional Roundtable, chaired by Senator Sheldon Whitehouse and Congressman Waxman, Russell Senate Office Building Room, Washington, D.C., Nov. 18.
- 2014 John P. McGovern Science and Society Award, *Sigma Xi*, The Scientific Research Society, Nov. 8.
- 2013 Frederick Holmes Lecture, Yale University, School of Medicine, September 16.
- 2013 Invited Member, Expert Advisory Committee for the Center for the History of Medicine and Public Health (CHM) at the New York Academy of Medicine.
- 2010 Elected to National Academy of Sciences, Institute of Medicine.
- 2008-2010 National Science Foundation, Grant, "The Quandary of Environmental Research: Lead, Children and Scientific Investigation."
- 2008-2010 National Institutes of Health, National Library of Medicine, "Sidewalk Asylums: A History of Homelessness in New York and Los Angeles."
- 2008- Fellow, New York Academy of History
- 2007 Lecturer, Coronado Conference on Integrity in Science, Bretton Woods, New Hampshire, May 4, 2007.
- 2006 Lecturer, Neurotoxic metals: lead, mercury and manganese. From research to prevention, Brescia, Italy, June 17-18, 2006
- 2006 Visiting Lecturer, Ecole des Hautes Etudes en Sciences Sociales, Paris, April- May, 2006.
- 2006 New York Committee on Occupational Safety and Health Annual Award for Outstanding Contribution to the Health of Workers and the Public, June, 2006.
- 2005 Fifth Annual Upton Sinclair Memorial Lecture for Outstanding Occupational Health, Safety, and Environmental Investigative Journalism, Social Concerns Committee, American Industrial Hygiene Association, May.
- 2005 Elected, Governing Council, American Association for the History of Medicine.
- 2003-2006 Robert Wood Johnson Foundation, Independent Investigators Award, The UN-Natural History of Disease.
- 2002-2003 "Oral Histories of Public Health Workers following September 11." Robert Wood Johnson Presidential Grant.

2002-2004	“The Impact of September 11 on the Public Health Infrastructure,” Milbank Memorial Fund Grant.
2001-2003	“Power and Pollution: The Politics of Industrial Disease.” Principle Investigator, National Science Foundation Research Grant
2000	Distinguished Alumnus Award, University of Massachusetts, School of Public Health
2000	Arthur Viseltear Award for “Outstanding Contributions to the History of Public Health,” Medical Care Section, <u>American Public Health Association</u> .
1996	John Lassiter Lecturer, "The Politics of Abandonment: Race and Mental Health in Post-War New York," <u>New York Academy of Medicine</u> , New York. May 2.
1996	Appointed University Distinguished Professor, City University of New York, Baruch College and CUNY Graduate School
1992	Presidential Excellence Award for Distinguished Scholarship, Baruch College/City University of New York
1987-1988	John Simon Guggenheim Fellow
1986	Elected to Delta Omega, Tau Chapter, Honorary Society in Public Health
1982-1983	National Endowment for the Humanities Fellow at the Hastings Center, Institute of Society, Ethics and the Life Sciences
1978	Elected to Sigma Xi, Honorary Science Society
1979	AHSR Dissertation Research Grant, NIH.
1973-1976	Josiah Macy Fellow in the History of Biology and Medicine
2013	<u>USA Today List of 12 Best New Books on the Environment</u> (http://www.usatoday.com/story/news/nation/2013/04/21/earth-day-best-new-environmental-books/2096489/)

Books:

Lead Wars: The Politics of Science and the Future of America’s Children, (co-authored with Gerald Markowitz), (Berkeley: University of California Press/Milbank Fund, 2013; 2014, Paper edition. Names one of top books on Environment, 2013, USA Today).

The Contested Boundaries of American Public Health, (co-edited with James Colgrove and Gerald Markowitz), (New Brunswick: Rutgers University Press, 2008).

Are We Ready? Public Health Since September 11th, (co-authored with Gerald Markowitz), (Milbank/University of California Press, , 2006)(Named as “American Schools of Public Health Deans’ List of Recommended Books, 2007).

Deadly Dust: Silicosis and the On-Going Struggle to Protect Workers' Health
New and expanded edition, (co-authored with Gerald Markowitz) (University of Michigan Press, 2005).

Deceit and Denial: The Deadly Politics of Industrial Pollution, (co-authored with Gerald Markowitz), (University of California Press/Milbank Memorial Fund,2002; paper 2003).

Children, Race, and Power: Kenneth and Mamie Clark's Northside Center, (co-authored with Gerald Markowitz), (University Press of Virginia,1996; Routledge Press, 2000).

"Hives of Sickness," Epidemics and Disease in New York,(edited) (Museum of the City of New York and New Brunswick: Rutgers University Press, 1995).

Deadly Dust: Silicosis and the Politics of Occupational Disease in Twentieth Century America, (co-authored with Gerald Markowitz), (Princeton: Princeton University Press, 1991; paper, 1994).(Noted as one of its "Outstanding Academic Books of 1991" by Choice).

Dying for Work: Safety and Health in the United States (ed. with G. Markowitz) (Bloomington: Indiana University Press, 1987; paperback ed. 1989).(Noted as an "Outstanding Academic Book of 1987" by Choice).

"Slaves of the Depression", Workers' Letters about Life on the Job, (ed. with G. Markowitz) (Cornell University Press, 1987).

A Once Charitable Enterprise, Hospitals and Health Care in Brooklyn and New York, 1885-1915, (Cambridge and New York: Cambridge University Press, 1982, (paper) 2004; Princeton: Princeton University Press,(paper) 1986).

World Civilization. V. 1&2, (ed. Western Hemisphere selections), (New York: McGraw-Hill, 1994,1997,2001, 2004). (Chinese Language Edition, Beijing, 2013).

Health Care in America, Essays in Social History (ed. with S. Reverby) (Philadelphia: Temple University Press, 1979).

B. Chapters in Book: (Including Major Encyclopedia Essays)

“Why Silicosis,” Ch. 1 in P.A. Rosental,ed., Silicosis: A World History, (Baltimore: Johns Hopkins Press, 2017).

“The History of Structural Approaches in Public Health,” [with James Colgrove and Amy Fairchild] in Structural Approaches in Public Health, eds., Marni Sommers and Richard Parker, (New York: Routledge, 2013), pp. 17-27.

“An Injury to One is an Injury to All: Movements for Occupational Safety and Health in Twentieth Century America,” Keynote [with Gerald Markowitz] in Brian Dolan and Paul Blanc, eds. At Work in the World: Proceedings of the Fourth International Conference on the History of Occupational and Environmental

Health, (San Francisco: University of California Press, Medical Humanities Press, 2012), pp.40-55.

“Making Distinctions Natural: The Uses of Categorization in Human Biology,” [with Dorothy Nelkin] in Robert Baker, ed. The Encyclopedia of Bioethics, (Cambridge University Press, 2009).

“‘Plastic Coffin,’ :Vinyl Chloride and the American and European Chemical Industry,” [with G. Markowitz] in Marie C. Nelson, ed. Occupational and Public Health, Lessons from the Past – Challenges for the Future, (Stockholm: Arbetslivsinstitutet, 2006), pp. 55-77.

“Public Health in U.S. Cities, A Historical Perspective,” in Freudenberg, Galea and Vlahov, eds. Cities and the Health of the Public, (Nashville: Vanderbilt Press, 2006), pp. 129-142.

“Building a Toxic Environment: Historical Arguments about the Past and Future of Public Health,” [with G. Markowitz] in Stevens and Rosenberg, eds. History & Health Policy in the United States: Putting the Past Back In, (New Brunswick: Rutgers University Press, 2006, pp. 130-152).

“Beyond Typhoid Mary: The Origins of Public Health at Columbia and in the City,” in Living Legacies at Columbia ed. by Tom (DRT) Mathewson, William Theodore De Bary (Editor), Jerry Kisslinger (Editor), (New York: Columbia University Press, 2006).

“Disease and Poverty,” in the Gwendolyn Mink and Alice O'Connor, Poverty in the United States: An Encyclopedia of History, Politics, and Policy (NY: ABC-CLIO, 2005)

“Toxic Torts: Historians in the Courtroom,” in Take Back the Academy, History of Activism., History as Activism ed. Jim Downs and Jennifer Manion, (New York: Routledge, 2004), 103-112.

“Beyond the Great Doctors’ Revisited: A Generation of the ‘New’ Social History of Medicine,” (with Susan Reverby), in John Harley Warner and Frank Huisman, eds. Locating Medical History, (Baltimore: Johns Hopkins Press, 2004), 167-193.

“Leona Baumgartner,” in Notable American Women, (Harvard University Press, 2004).

“The Trustees’ Dilemma: Hospitals as Benevolence or Business – Looking Back a Century,” (with Elizabeth Robilotti), in The Ethics of Hospital Trustees, ed. By Bruce Jennings, (Washington: Georgetown University Press, 2004)

“The History of the Lead Industry’s Promotion of White Lead Paints,”[with Gerald Markowitz], in New York State Bar Association, Lead Paint Poisoning Prevention and Litigation, (New York: NYSBA, 2002) pp. K-1-K-56.

“From Dust to Dust: The Birth, Death and Rebirth of the Silicosis Issue,”(with G. Markowitz), in Steve Kroll-Smith, Philip Brown, Valerie Gunter, eds., Illness and the Environment, (New York University Press,2000)162-175.

“Hospitals, Health Insurance, and the American Labor Movement,” (with G. Markowitz), in Alan Marcus and Hamilton Cravens, eds.,“Hospitals, Health Insurance, and the American Labor Movement,” (with G. Markowitz), in Alan Marcus and Hamilton Cravens, eds., Health Care Policy in Contemporary America, (University Park: Pennsylvania State University Press, 1997, pp.74-94.

"Hives of Sickness and Vice," Introduction to: Hives of Sickness, Public Health and Epidemics in New York City, (Rutgers University Press, 1995), pp. 1-30.

"Disease and Society During the Twentieth Century," in Columbia World History of the Twentieth Century, ed. By Richard Bulliet, (Columbia University Press, 1998)

"Occupational Disease," Cambridge History and Geography of Disease, (with G. Markowitz), (New York: Cambridge University Press, 1993), 187-192 (20 mss. pages).

"Health Care," in Encyclopedia of American Social History, v.III, ed. by M. Cayton, E. Gorn, P. Williams, (New York: Scribners, 1993), pp.2399-2409 (40 mss. pages).

"Deadly Fuel, Leaded Gasoline and the Growth of the Automobile Industry," in Graebner, True Stories, (McGraw-Hill, 1992), pp. 126-141; (second edition, 1996, third edition, 2003).

"Epidemics," and "Medicine," in The Readers' Companion to American History, ed. by E. Foner and J. Garraty, (Boston: Houghton Mifflin Co., 1991), pp. 354-356; 717-719.

"Doing Good or Doing Well, The Origins of Modern Hospital Administration", in Golden and Long, Hospitals and Community (Ithaca: Cornell University Press, 1989, pp.157-169.

"Uniformity and Homogeneity, Historical Perspectives on the American Hospital," in Seay and Vladeck, eds. In Sickness and in Health, The Mission of the Voluntary Hospital, (McGraw-Hill, 1988), pp. 87-123.

"Workers' Health and Safety - Some Historical Notes," (with G. Markowitz), Introduction to Dying for Work, Workers' Safety and Health in Twentieth Century America, (Bloomington: Indiana University Press, 1987), pp.ix-xx.

"Safety and Health as a Class Issue: The Workers' Health Bureau of America, During the 1920s," in Rosner and Markowitz, eds. Dying for Work, Workers' Safety and Health in Twentieth Century America, (Bloomington: Indiana University Press, 1987), pp.53-63. (Revised from previously published article).

"Research or Advocacy: Federal Occupational Safety and Health Policies During the New Deal," in Rosner and Markowitz, eds. Dying for Work, Workers' Safety and Health in Twentieth Century America, (Bloomington: Indiana University Press, 1987), pp. 83-102.(Revised from previously published article).

"'A Gift of God'?" The Public Health Controversy over Leaded Gasoline," in Rosner and Markowitz, eds. Dying for Work, Workers' Safety and Health in Twentieth Century America, (Bloomington: Indiana University Press, 1987), pp. 121-139.(Revised from previously published article).

"In the Grime and Dirt of a Nation,"(with G. Markowitz), Introduction to "Slaves of the Depression," Workers' Letters About Life on the Job, (Ithaca: Cornell University Press, 1987), pp.1-16.

"Safety and Health During the Progressive Era," (with G. Markowitz), in J. Leavitt and R. Numbers, Sickness and Health in America, 2nd edition, 1986, (third edition, 1998) pp.507-521.

"American Public Health Association," Social Service Organizations, P. Romanofsky, ed. (Westport: Greenwood Press, 1978).

"Beyond the Great Doctors", (with S. Reverby), Introduction to Health Care in America, Essays in Social History, (Philadelphia: Temple University Press, 1979), pp.3-17.

"Business at the Bedside: Brooklyn's Hospitals During the Progressive Era," in S. Reverby and D. Rosner, eds., Health Care in America, pp. 117-130, reprinted in Health PAC Bulletin, 1979.

C. Papers in Professional Journals and Major Reports:

"'Nondetected': The Politics of Measurement of Asbestos in Talc, 1971-1976," AJPH, [with Gerald Markowitz and Merlin Chowkwanyun], 109(July, 2019), 969-974.

Editorial, "A Tribute to Elizabeth Fee for Her Powerful Work on Behalf of Public Health," AJPH, 109(June 2019), 875-876.

"A Climate of Ignorance Envelops the United States," Milbank Quarterly, (June, 2019) published online, March 29, 2019. Available at: https://www.milbank.org/quarterly/articles/a-climate-of-ignorance-envelops-the-united-states/?utm_source=Milbank+Email+List&utm_campaign=00b53aee5c-EMAIL_CAMPAIGN_2018_01_09_COPY_02&utm_medium=email&utm_term=0_dbce9df54c-00b53aee5c-74925817 , Accessed: March 29, 2019.

"An Enormous Victory for Public Health in California: Industries are Responsible for Cleaning Up the Environments they Pollute," (with G. Markowitz), AJPH, 109(February, 2019), 211-212. Available online: https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2018.304887?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed .

"Monsanto, PCBs, and the Creation of a World-wide Ecological Problem," Journal of Public Health Policy, 39(Nov. 2018),[with Gerald Markowitz], pp. 463-540. Available at: <https://link.springer.com/article/10.1057/s41271-018-0146-8> .

"'The Defense of the Indefensible': The Uses and Abuses of Words in Contemporary Public Health Policy," Milbank Quarterly, Early View: December, 2018, Available at: <https://www.milbank.org/quarterly/articles/the-defense-of-the-indefensible-the-uses-and-abuses-of-words-in-contemporary-public-health-policy/>

"Climate Denial and a (Hopeful) Lesson from History," Milbank Quarterly, 96(September, 2018), pp. 430-433. Available at: <https://onlinelibrary.wiley.com/doi/epdf/10.1111/1468-0009.12341> .

"Untold Power Meets Unheralded Resolve: The Latest Machinations over Lead Paint in California," Milbank Quarterly, 96(June ,2018), pp. 235-238. Available at: <https://onlinelibrary.wiley.com/doi/epdf/10.1111/1468-0009.12324> .

"States Protecting the Public Interest in the Era of Trump," Milbank Quarterly, 96(March, 2018), pp.25-28. Available at: <https://onlinelibrary.wiley.com/doi/epdf/10.1111/1468-0009.12309> .

“ToxicDocs (www.ToxicDocs.org): from history buried in stacks of paper to open, searchable archives online,” (with G. Markowitz and M. Chowkwanyun), Journal of Public Health Policy, 39(February, 2018), pp. 4-11. Available at: <https://link.springer.com/article/10.1057/s41271-017-0106-8> .

“Stewing Over Chemical Soups,” Milbank Quarterly, 95(December 2017), 714-717. Available at: <https://onlinelibrary.wiley.com/doi/10.1111/1468-0009.12294> .

“Sophie’s Choice on the Nation’s Health,” Milbank Quarterly, September, 2017, <https://www.milbank.org/quarterly/articles/sophies-choice-nations-health/> .

“Trying Times: The Courts, the Historian, and the Contentious Struggle to Define Disease,” Bulletin of the History of Medicine, 91(Fall, 2017), 473-493.

“Ain’t Necessarily So!”: The Brake Industry’s Impact on Asbestos Regulation in the 1970s,” American Journal of Public Health, [with G. Markowitz], (Published online ahead of print, July 20, 2017, e1-e5); 107(September, 2017), 1395-1399.

“Deregulating Safety: The Case of the Effort to Ban Asbestos,” Milbank Quarterly, 95(June, 2017), 257-260. Available at: <https://www.milbank.org/quarterly/articles/deregulating-safety-case-effort-ban-asbestos/>

“Health, Climate Change, and the Descent of Science-Based Policy,” Milbank Quarterly, 95(March, 2017). Available at: <https://www.milbank.org/quarterly/articles/health-climate-change-descent-science-based-policy/> .

“Webs of Denial: Climate Change and the Challenge to Public Health,” Milbank Quarterly, 94(December, 2016). Available at: <https://www.milbank.org/quarterly/articles/webs-denial-climate-change-challenge-public-health/> .

Markowitz G, Rosner D. “Citizen Scientists and the Lessons of Flint,” The Milbank Quarterly, Online Exclusive. www.milbank.org/quarterly/articles/citizen-scientists-lessons-flint. Published October 13, 2016. Available at: <https://www.milbank.org/quarterly/articles/citizen-scientists-lessons-flint/> .

“A Lead Poisoning Crisis Enters Its Second Century), Health Affairs, 35(May, 2016), 756-759.

“Injurious Inequalities,” Milbank Quarterly, 94(March 2016), 47-50. Available at: <https://www.milbank.org/quarterly/articles/injurious-inequalities/> .

“‘Unleashed on an Unsuspecting World’: The Asbestos Information Association and Its Role in Perpetuating a National Epidemic,” (with G. Markowitz), American Journal of Public Health, 106(April, 2016), 834-40.

“Flint, Michigan: A Century of Environmental Injustice,” American Journal of Public Health: 106(February 2016), pp. 200-201.

“How Many Flints are There?,” [with Gerald Markowitz] The Nation, February 9, 2016, Available at: <https://www.thenation.com/article/how-many-flints-are-there/> , Accessed: March 13, 2016.

“‘Educate the Individual . . . to a Sane Appreciation of the Risk’: A History of Industry’s Responsibility to Warn of Job Dangers Before the Occupational Safety and Health Administration,” (with G. Markowitz), American Journal of Public Health, 106(January, 2016), 28-35.

“Building the World that Kills Us: the Politics of Lead, Science and Polluted Homes, 1970 to 2000,” (with G. Markowitz), J. of Urban History, (January, 2016).

“Courting Disaster: Environmental Justice and the US Court System,” Milbank Quarterly, 93 (2015), pp. 471-474) Available at: <https://www.milbank.org/quarterly/articles/courting-disaster-environmental-justice-and-the-us-court-system/> .

“From Silicosis To Silica Hazards: An Experiment In Medicine, History, And The Social Sciences” (with Paul-Andre Rosental and Paul Blanc), American Journal Of Industrial Medicine, 58(Nov. 2015), 53-55.

“Criteria for Action in Population Health: The Hill Criteria a Half Century Later,” Milbank Quarterly, 93(June, 2015), 259-262. Available at: <https://www.milbank.org/quarterly/articles/criteria-for-action-in-population-health-the-hill-criteria-a-half-century-later/> .

“Blowing the Lid off Mountaintops,” Milbank Quarterly, 92(Dec. 2014), 648-651. Available at: <https://www.milbank.org/quarterly/articles/blowing-the-lid-off-mountaintops/> .

“Swimming Upstream: Probing the Problem of Pollution,” Milbank Quarterly, 93(March, 2015), pp.8-11. Available at: <https://www.milbank.org/quarterly/articles/swimming-upstream-probing-the-problem-of-pollution/> .

“Imagination and Public Health: The End of Lead Poisoning in California?” Milbank Quarterly, 92(September, 2014), 430-433. Available at: <https://www.milbank.org/quarterly/articles/imagination-and-public-health-the-end-of-lead-poisoning-in-california/> .

“The Long Struggle to Protect Workers’ Lungs Against Silicosis,” Milbank Quarterly, 92(June, 2014), 191-194. Available at: <https://www.milbank.org/quarterly/articles/the-long-struggle-to-protect-workers-lungs-against-silicosis/> .

“Persistent Pollutants: A Brief History of The Discovery of the Widespread Toxicity of Chlorinated Hydrocarbons,” Environmental Research, (with Gerald Markowitz) (Jan. 2013), 126-133. <file:///C:/Users/dr289/Documents/My%20Dropbox/New%20Folder/David%20and%20Jerry/pdfs/pdfs%20of%20our%20articles%20/dx.doi.org/10.1016/j.envres.2012.08.011> .

“With the Best Intentions: Lead Research and the Fate of America’s Children,” American Journal of Public Health, (with Gerald Markowitz) 102 (November, 2012), e19-33.

“From the Triangle Fire to the BP Explosion: A Short History of the Century-Long Movement for Safety and Health,” (with Gerald Markowitz), New Labor Forum, 20(Winter, 2011), 27-32.

“Traditions, Transitions and Transfats: New Directions for Public Health,” Public Health Reports, (with Linda Fried),125(January-February, 2010), 3-7.

"The Exodus of Public Health: What History Can Tell Us about Its Future," American Journal of Public Health, (with Amy Fairchild) 100 (January, 2010), 54-63.

"Schools of Public Health Are Essential Infrastructure of a Responsible Society and a Twenty-First Century Health System," Public Health Reports, (with Colgrove et. al.), 125(Commentary, January-February, 2010)8-14.

"Spanish flu, or Whatever It Is...": The Paradox of Public Health in a Time of Crisis," Public Health Reports, (Special Supplement, April, 2010).

"Vinyl Chloride Propellant in Hair Spray and Angiosarcoma of the Liver Among Cosmetologists and Barbers: Case Reports," [with Gerald Markowitz, et. al.] International Journal of Occupational and Environmental Health 15(April, 2009) 36-42.

"The Trials and Tribulations of Two Historians: Adjudicating Responsibility for Pollution and Personal Harm," [with Gerald Markowitz], Medical History, 53(April, 2009), 271-292.

"When History Goes to Court," Revue d'histoire Moderne et Contemporaine, [with Gerald Markowitz] (forthcoming, Winter, 2009).

"Trials and Tribulations: What Happens When Historians Enter the Courtroom," Law & Contemporary Problems, 72(Winter, 2009), 137-158.

"L'histoire au Prétoire: Deux Historiens dans les Procès des Maladies Professionnelles et Environnementales," (with G. Markowitz), Revue d'Histoire Moderne & Contemporaine, 56(Jan-Mars, 2009), 227-255.

" 'A Problem of Slum Dwellings and Relatively Ignorant Parents': A History of Victim-Blaming in the Lead Pigment Industry," Environmental Justice, 1(September 2008), 159-168.

"Bringing History to the Public," Environmental History, 12(April, 2007), 365-368.

"The Politics of Lead Toxicology and the Devastating Consequences for Children," [with Gerald Markowitz], American Journal of Industrial Medicine, 50(September, 2007)740-756.

"Standing Up to the Lead Industry: An Interview with Herbert Needleman," Public Health Reports, 120(May-June, 2005), 300-337. [with G. Markowitz]

J. Lockhardt Gibson and the Discovery of the Impact of Lead Pigments on Children's Health: A Review of a Century of Knowledge," Public Health Reports, 120(May-June, 2005), 296-300. [with B. Lanphear and G. Markowitz].

"Uncovering a Deadly Cancer: The National Implications of Revelations at the B.F. Goodrich Plant in Louisville," [with Gerald Markowitz], The Register of the Kentucky Historical Society, 102(Spring, 2004), 157-181.

Emergency Preparedness, Bioterrorism, and the States: The First Two Years After September 11, [with G. Markowitz], (New York: Milbank Memorial Fund Report, 2004), 78 pages.

"The Struggle over Employee Benefits: The Role of Labor in Influencing Modern Health Policy," [With Gerald Markowitz] Milbank Quarterly, 81(Mar 2003). Available at: <https://www.milbank.org/quarterly/articles/the-struggle-over-employee-benefits-the-role-of-labor-in-influencing-modern-health-policy/> .

“Politicizing Science: The Case of Bush Administration’s Influence on the Lead Advisory Panel at the Centers for Disease Control,” [with Gerald Markowitz], Journal of Public Health Policy, (Summer ,2003), pp.101-124.

September 11 and the Shifting Priorities of Public and Population Health, [with G. Markowitz], New York: Milbank Memorial Fund Report, 2003).

“Cursed Bugiardi,” Epidemiologia e Prevenzione,[with G. Markowitz, Italian Translation from English] 27(January-February)2003.

“Corporate Responsibility for Toxins,”[with Gerald Markowitz], Annals of the American Academy of Political and Social Science, 584(November, 2002)159-174.

“Industry Challenges to the Principle of Prevention in Public Health: The Precautionary Principle in Historical Perspective,” [With Gerald Markowitz], Public Health Reports, 117(2003)501-512.

“Lead: The Relevance of History,”[with Gerald Markowitz], Mealey’s Litigation Report, [LexisNexis], Nov. 1, 2001, 1-19.

“Two Lives, Three Legs, One Journey: A Retrospective Appreciation of Zena Stein and Mervyn Susser,” [with Gerald Oppenheimer], International Journal of Epidemiology, 31(2002)49-53.

“‘Le Prove di una Cospirazione Illegale delle Imprese,’: Il Cloruro di Vinile e L’industria Chimica in America e in Europa,”[“Evidence of an Illegal Conspiracy by Industry’: Vinyl Chloride and the American and European Chemical Industry,”] Epidemiologia e Prevenzione, [Translated in Italian], with G. Markowitz, (November, 2002).

“Historical Perspectives on New York City Health,” [with Amy Fairchild], International J. of Mental Health, 28(Winter, 1999-2000), 9-19.

“Cater to the Children”: The Role of the Lead Industry in a Public Health Tragedy, 1900-1955,”[with Gerald Markowitz] American Journal of Public Health, 90(January 2000),36-46.

“Labor Day and the War on Workers,” American Journal of Public Health, September,[with G. Markowitz] 89(September,1999), 1319-1321.

“When Does a Worker’s Death Become Murder?,” American Journal of Public Health, 90(April, 2000).

“*The Living City*,: Engineering Social and Urban Change in New York City, 1865to 1920,” (with Amy Fairchild), Bulletin of the History of Medicine, 73(Winter, 1999), 124-129.

“The Reawakening of National Concern About Silicosis,” Public Health Reports, 113(July/August 1998),302-311.

“Battle for Breath,” (with G. Markowitz),Dissent, Spring, 1998, pp.44-48.

“Race, Foster Care and the Politics of Abandonment in New York City,” American Journal of Public Health, 87(Nov. 1997), pp.1844-1849.

"Hospitals, Health Insurance and Labor: Blue Cross and New York in the Post World War II Decades,"(with G. Markowitz), Journal of Policy History, Winter, 1997.

"Topics for Our Times: Don't Inhale -- Reflections on Garbage!," American Journal of Public Health, 86(February, 1996)159-161.

"The Limits of Thresholds, Silica and the Politics of Science, 1935 to 1990," (with Gerald Markowitz), American Journal of Public Health, 85(Feb. 1995), 253-262.

"Workers, Industry, and the Control of Information: Silicosis and the Industrial Hygiene Foundation,"(with G. Markowitz), Journal of Public Health Policy, (Spring, 1995), 29-58.

"Race, Youth and Labor," American Journal of Industrial Medicine, (Spring, 1992).

"Consumption, Silicosis and the Social Construction of Industrial Disease," (with G. Markowitz) Yale Journal of Biology and Medicine, 64(Fall, 1991), 481-498.

"Seeking Common Ground: A History of Labor and Blue Cross" Journal of Health Politics, Policy and Law,(with G. Markowitz) 16(Winter, 1991),695-718.

"Between Public and Private: A Half Century of Blue Cross in New York," (with Fox and Stevens), Journal of Health Politics, Policy and Law, 16(Winter, 1991), 643-650.

"Expert Panels and Medical Uncertainty," (with Gerald Markowitz), American Journal of Industrial Medicine, (Winter, 1990-91), 131-134.

"The Illusion of Medical Certainty, Silicosis and the Politics of Industrial Disease," (With G. Markowitz) Milbank Quarterly, (Supplement 2, 67 (1989) pp. 228-253)revised and reprinted in Framing Disease, ed. by Charles Rosenberg and Janet Golden, (Rutgers University Press, 1991). Available at: <https://www.milbank.org/quarterly/articles/the-illusion-of-medical-certainty-silicosis-and-the-politics-of-industrial-disability-1930-1960/> .

"Street of Walking Death," (with G. Markowitz), Journal of American History, 77(September, 1990),525-552 ("reprinted" in CD-ROM by McGraw Hill).

"Death and Disease in the House of Labor," (with G. Markowitz), Labor History, 30(Winter, 1989), pp.113-117.

"A Note About George Rosen and His Final Paper," Journal of the History of Medicine, 43(October, 1988), 386-390.

"More than Economism, Safety and Health Policy, 1934-1947," Milbank Quarterly, (with G. Markowitz), 64(Summer, 1986), pp. 331-354. Available at: <https://www.milbank.org/quarterly/articles/more-than-economism-the-politics-of-workers-safety-and-health-1932-1947/> .

"Poison at the Pump," (with G. Markowitz) Thesis, (Fall, 1986), (22-29).(Awarded a Silver Medal for "Best Articles of the Year," by the Council for the Advancement and Support of Education).

"A 'Gift of God'? The Public Health Controversy over Leaded Gasoline During the 1920s." American Journal of Public Health, (with G. Markowitz), 75(April, 1985),344-352; (reprinted in The Underside of American History, 5th Edition, and Dying for Work).

"Advocacy and Science in Conflict: The U.S. Department of Labor and the Public Health Service and Occupational Safety and Health Between the Wars", (with G. Markowitz) Journal of Social History, 18(March, 1985), 365-381, (reprinted in Dying for Work).

"Safety and Health as a Class Issue: The Workers' Health Bureau of America, 1921-1927," (with G. Markowitz) Science and Society, 48(Winter, 1984/85), 466-482 (reprinted in Dying for Work).

"Health Care and the 'Truly Needy', Nineteenth Century Origins of the Concept," Milbank Quarterly, 60(Summer, 1982), 355-385. Available at: <https://www.milbank.org/quarterly/articles/health-care-for-the-truly-needy-nineteenth-century-origins-of-the-concept/> .

"Living History," (with B. Rosenkrantz), American Journal of Public Health, 83(Oct.1982)1107-1109.

"Gaining Control: Reform, Regulation and New York's Community Hospitals," American Journal of Public Health, 70(May, 1980),533-542.

"Doctors in Crisis: The Use of Medical Education Reform", (with G. Markowitz), American Quarterly, 25(March 1973), 87-105, reprinted in S. Reverby and D. Rosner, eds. Health Care in America, (Philadelphia: Temple University Press, 1979).

"Social Control and Social Service: The Changing Use of Space in Charity Hospitals," Radical History Review, 21(Fall, 1979), 183-197.

"Tempest in a Test-Tube, Medical History and the Historian," Radical History Review, 26(1982)166-171.

Review Essays

"'Disease and Discovery,' and 'Health and Humanity,'" Bulleting of the History of Medicine, 91(Summer, 2017), pp. 459-462.

"Dead on Arrival: The Politics of Health Care in Twentieth Century America," Business History Review, (Spring, 2004), 148-151.

"A Plague on Your House," J. of Public Health Policy, (2002).

"Human Guinea Pigs: Medical Experimentation Before World War II," Reviews in American History, December, 24(Dec.1997),652-656.

"Technology in the Hospital," Reviews in American History, 25(1997).

"Losing Patients: Culture, Consumption and Popular Ideas about Science and Medicine," Reviews in American History, 17(June, 1989).

"Institutions Tranformed," Science, 239(Jan. 1988), pp.79-80.

"Bearing Down," in Reviews in American History, 15(December, 1988),pp.668-673.

"For the Poorest of the Poor," Reviews in American History, 12(June, 1984), pp.236-240.

"Organized Medicine," Man and Medicine, 5(1980), pp.69-75.

"State of the Art in Medical Historiography - The Social Transformation of American Medicine by Starr," in Journal of Health Politics, Policy and Law, 8(1983),p. 611-616.

E. Book Reviews:

Selected Book Reviews:

Blanc, Fake Silk, in Bulletin of the History of Medicine, 92(2018), pp.

Sellers and Mellin, eds. "Dangerous Trade," in Bulletin for the History of Medicine, 86(2012), 677-678.

McGarrity, "Bending Science," Journal of Clinical Investigation, 119(January, 2009), 2.

Blum, "Love Canal Revisited: Race, Class, and Gender in Environmental Activism," Journal of American History (2009).

Murphy, "Sick Building Syndrome and the Problem of Uncertainty," Journal of the History of Medicine and Allied Sciences April, 2007.

Daniel, "Toxic Drift," Journal of Environmental History, (April, 2007), 419-421.

Gordon, "Dead on Arrival," Business History Review, (2004).

Risse, "Mending Bodies," ISIS, 94(June 2003), 336-337

Hammonds, Childhood's Deadly Scourge, in Journal of Health Policy, Politics and Law, 26(Dec. 2001), pp. 195-198.

Opdycke, Public Hospitals, Bulletin of the History of Medicine, (Fall, 2000).

Fitzpatrick, "The Blues," Journal of American History, 1998.

Carson, Healing Body, Mind, and Spirit: The History of the St. Francis Medical Center Pittsburgh, Pennsylvania, (June, 1996) in Journal of Social History.

Gamble, Making a Place for Ourselves, in ISIS, 1996.

Cole, Elements of Risk and Casamayou, Bureaucracy in Crisis, in Annals of the American Association of Political Science, (Winter, 1996).

Duffy, History of Public Health in New York City, 1866-1966, in Social Science and Medicine, 10(1976), p.201-202.

Brieger, Theory and Practice in American Medicine, in Social Science and Medicine, 11(1977), p.299.

Fischer, Growing Old in America, in Journal of Health Politics, Policy and Law, 3(1979), p.576-578.

Rosen, Healing and History - Essays for George Rosen, in ISIS, 71(1980), p. 675-676.

Scull, Madhouses, Mad Doctors, and Madmen - The Social History of Psychiatry in the Victorian Era, in ISIS, 74(1983), p. 264-265.

Melosh, The Physician's Hand, in Journal of American History, 70(Dec. 83), 636-7.

Treacher, The Problem of Medical Knowledge, in Social Science and Medicine, 18(84), 1098-99.

Numbers, Compulsory Health Insurance, in Technology and Culture, 26(April, 1985), 328-9.

Lee, The Nation's Health, 2nd Edition, in Inquiry, 22(1985), p.103.

Drachman, Hospital with a Heart, in Journal of Social History, 20(Winter, 1986), 391-92.

Thackrah, The Effects of Arts, Trades, and Professions on Health and Longevity, in ISIS, 78(June, 1987), 288-90.

Cherniack, The Hawk's Nest Incident, in ISIS, 78(Dec. 1987), 656-7.

Noble, Liberalism at Work, in Dissent, 34(Summer, 1987), 397-98.

Navarro, Crisis, Health, and Medicine, in Inquiry, 24(1987), p.191-192.

Weindling, The Social History of Occupational Health, in Journal of Social History, 21(Spring, 88), 582-3.

Hollingsworth, A Political Economy of Medicine - Great Britain and the United States, 74(1988), p. 1386-1387.

Kornbluh, A New Deal for Workers' Education, in Journal of American History, 75(1989), p.1363.

Sicherman, Alice Hamilton, in Journal of Public Health Policy

Proctor, Racial Hygiene - Medicine Under the Nazis, in Journal of Health Politics, Policy and Law, 16(1991), no.2, pp.419-422.

Young, Pure Food - Securing the Federal Food and Drugs Act of 1906, in Journal of American History, 77(1991), p.1392.

Ellis, Yellow Fever and Public Health in the New South, in American Historical Review, 98(1993), p.1328-1329.

Curran, Dead Laws for Dead Men, in Journal of American History, 81(September, 1994), 756.

Hendricks, A Model for National Health Insurance, in American Historical Review, 99(September, 1994), 999.

Fox, Power and Illness, in Journal of Health Politics, Policy and Law, (1995).

Casamayou, Bureaucracy in Crisis, and Cole, Elements of Risk, in Annals of the American Academy of Political and Social Science, (1995).

7. Non-Refereed Publications

"Les Zones Contaminees, Prelude a une Planete Sans Vie," (with G. Markowitz), Le Monde, September 3, 2018, p. 17.

"Beyond Typhoid Mary: The Origins of Public Health at Columbia and in the City," Columbia Magazine, Spring, 2004, pp.23-28.

"Pollute the Poor," The Nation, July 6, 1998.

"Harlem's History of Pain," New York Newsday, September 30, 1994, Op-Ed Page.

"Hospitals," in American Cities and Suburbs: An Encyclopedia, (Greenwood Press, 1996), 12 ms. pages.

"Race and Foster Care," (with G. Markowitz), Dissent, (Spring, 1993), 233-237.

"Historical Perspective on the Mission of the Voluntary Hospital," in Health Care: Industry or Ministry? Proceedings of the TeKolste Forum, (Indianapolis: Indiana Hospital Association, 1991), pp. 69-105.

"Disaster Stalked the Workplace," The Clarion, April, 1990, pp.7,10.

"Beth Israel's Early Years," in The First Hundred Years, Beth Israel Medical Center, A Common Purpose and Shared Commitment, (New York: Beth Israel Hospital, 1990), pp.29-41.

"Occupational Health," in Pittsburgh Post-Gazette, Nov. 22, 1988, p.15 in Special Section, "Health and Human Values."

"Health, Hospitals and Class," Seaport Magazine, 21(Fall, 1987),28-33.

"Workers and the 'Right to Know,'" Our Right to Know, Fund for Open Information and Accountability, Spring, 1985, pp.15-16.

"Biographies of Great Physicians," American Medical Biography, (Westport:Greenwood Press, 1984)

"The Specter of Limits," New York Times, Op-Ed. page, June 11, 1980.

various letters to the New York Times, newspapers and professional newsletters, etc.

8. Recent Web Publications:

"You Say Troposphere, I Say Stratosphere" at The Pumphandle, A Watercooler for the Public Health Crowd," <http://thepumphandle.wordpress.com/2007/01/08/you-say-troposphere-i-say-stratosphere/>

"9/11: Katrina Started at Ground Zero," at Tomdispatch, (The Nation Institute)
http://www.tomdispatch.com/post/118304/rosner_and_markowitz_9_11_as_the_first_katrina_moment/,

"The Problem with Smallpox," at Tomdispatch_(The Nation Institute),

http://www.tomdispatch.com/post/224/the_smallpox_scare .

“OSHA at Forty,” at Huffington Post, http://www.huffingtonpost.com/david-rosner/osha-at-forty_b_804195.html

[The Atlantic on Lead Paint and the Soda Ban](http://www.theatlantic.com/health/archive/2013/04/why-it-took-decades-of-blaming-parents-before-we-banned-lead-paint/275169/) (The Atlantic, April 22, 2013: <http://www.theatlantic.com/health/archive/2013/04/why-it-took-decades-of-blaming-parents-before-we-banned-lead-paint/275169/>)

[New York Review of Books on Lead Wars](http://www.nybooks.com/articles/archives/2013/mar/21/lead-poisoning-ignored-scandal/?pagination=false) March 21, 2013: <http://www.nybooks.com/articles/archives/2013/mar/21/lead-poisoning-ignored-scandal/?pagination=false>

[America Is Poisonous to Your Health](http://www.salon.com/2013/04/29/christie_3_partner/) (Salon: April 29, 2013: http://www.salon.com/2013/04/29/christie_3_partner/)

Grants-in-Aid and Elected Positions:

2008-2010	Principle Investigator, National Science Foundation, Grant, “The Quandary of Environmental Research: Lead, Children and Scientific Investigation.”
2008-2010	Principle Investigator, National Institutes of Health, National Library of Medicine, “Sidewalk Asylums: A History of Homelessness in New York and Los Angeles.”
2004-2008	Governing Council, American Association for the History of Medicine
2003-2006	Robert Wood Johnson Investigator Award for “The Un-Natural History of Public Health: From Epidemics and Injuries to Chronic Illness and Bio-Terrorism.” (with Gerald Markowitz).
2002-2003	Principle Investigator, Oral Histories of September 11. Robert Wood Johnson Foundation Presidential Award.
2002-2004	Principle Investigator, The Future of Public Health, Milbank Memorial Fund.
2000-2002	Principle Investigator, National Science Foundation, “The Shifting Boundaries of Occupational and Environmental Health.”
1999-2000	Principle Investigator, National Science Foundation, Research Grant, “Building the Living City.”
1992-95	Principal Investigator, "Race and Mental Health in New York, 1946-1976," National Endowment for the Humanities Interpretive Research Grant.
1992-93	Research Grant, The Winthrop Group, "Northside, Mental Health and Race,"
1990-	Principal Investigator, <u>Northside, Youth and Harlem, 1946-present</u> , Ford Foundation, New York Times; and Lilly Foundation Grants.

1989-90	Metropolitan Life Research Award, Center for the Study of Philanthropy
1991	Panelist, <u>Agency for Health Services Research</u> . U.S. Department of Health and Human Services.
1990	George Rosen Lecturer, <u>Yale University School of Medicine and Beaumont Medical Club</u> , New Haven.
1989	Panelist, National Endowment of the Humanities, Interpretive Research Grants.
1988-	Associate Editor for Health and Medicine, <u>Encyclopedia of New York City</u> , (Yale University Press, 1995).
1988-	Advisory Board, Museum of the City of New York Project on the History of Epidemics in New York.
1987-1989	Co-Principal Investigator (with G.Markowitz), National Endowment for the Humanities, Interpretive Research Grant. <u>A History of Occupational Safety and Health</u>
1987-1989	Co-Project Director, "Philanthropy in American Society" from Kellogg Foundation and American Association of Colleges
1986-1993	Research Grants, PSC-CUNY Award
1986-1987	Research Grant, <u>Health Services Improvement Fund</u> , Blue Cross History Project
1985-1987	Research Grant, <u>Milbank Memorial Fund</u> (with G. Markowitz).
1983-1985	"The Movement for Occupational Safety and Health Before the Wars", PSC-CUNY Research Grant
1982-1983	CUNY Scholar Incentive Award
1976-1978	Principal Investigator, Pre-Doctoral Research Grant, National Center for Health Services Research, U.S. Dept. of Health and Human Services.

Presented Papers, Lectures: Below is a very limited variety of presentations delivered. Below this is a listing of others delivered at various universities and professional organizations.

Mt. Sinai School of Medicine, Environmental and Occupational Health Seminar, "Judging Public Health," Dec. 13, 2017.

New York Academy of Sciences, "Science Denial: Lessons and Solutions," Nov. 2, 2018.

David Rogers Memorial Lecture, Weill-Cornell Medical Center, January 10, 2018.

McGovern Award Lecture, "Judging Science: The Historian, the Courts, & Discerning Responsibility for The Blowback of a Century of Pollution," Sigma Xi Annual Meeting, Tempe, Arizona, November 8, 2014.

Keynote Speaker, "Reflections on a Century of Occupational Health and Safety History, American Public

Health Association, OSH Section Celebration, New Orleans, November 18, 2014.

“Disease on Trial: the Courts, the Lawsuit and the Public Negotiation over Responsibility for Disease,” Centre for History in Public Health, London School of Hygiene & Tropical Medicine, 20th November, 2014.

“Judging Science: The Historian, the Courts, and Discerning Responsibility for Environmental Pollution,” Heyman Center for the Humanities, Columbia, October 22, 2014.

“Law and (American) Order : A Historian Looks at the Workplace, the Worker and American Justice”, Cultures et Sociétés Urbaines, Cresppa, Paris, France, September 23, 2014,.

Bicameral Task Force on Climate Change, Senator Whitehouse and Congressman Waxman, Russell Senate Building, Washington, D.C., September 18, 2014.

“Lead Wars,” American Public Health Association Annual Conference, Boston Convention Center, November 11, 2013.

“Lead Wars,” Lehman Center for American History, Columbia University, October 8, 2013.

Day-Long Conference on “Lead Wars,” at University of Virginia, Miller Center, October 3-4, 2013.

Organizer and Presenter, “Silicosis in International Perspective,” Science Po, Paris, France, September 24, 2013.

“Lead Wars,” University Lecture, University of Wisconsin, September 18, 2013.

“The Politics of Science,” Robert Wood Johnson foundation, New Brunswick, New Jersey, September 12, 2013.

“Lead Wars: The Politics of Science,” American Public Health Association Conference, November, 2013.

“Silicosis and It’s International Meaning,” Sciences Po, Paris France, September 24, 2013. (Meeting organized by David Rosner (Columbia) and Paul Andre Rosental (Science Po) through the Alliance.

“Lead Wars: The Politics of Science,” University of Wisconsin, School of Medicine, Colloquia in the History of Medicine, September 17, 2013.

“Science, Politics and Science Politics,” Frederick Holmes Lecture, Yale University School of Medicine, September 16, 2013.

“Lead Wars,” Café Columbia, April 1, 2013.

“Lead Wars: The Politics of Science,” Ethics in Science, University of Houston, March 25, 2013.

“Lead Wars,” presented at “History In Action,” Columbia University, March 9, 2013.

“Lead Wars: Science and the Fate of America’s Children,” John P. McGovern Lecture, Yale’s School of Medicine, Fall, 2013.

“With the Best of Intentions,” Bates Center for History of Nursing, University of Pennsylvania, February 29, 2012.

“Commentary,” on “Foreclosed: Rehousing the American Dream,” Museum of Modern Art Symposium, New York, February 17, 2012.

“With the Best of Intentions? Universities, Low-Level Dangers, and The Coming Crisis in Public Health” Harvard University Health Services Clinical Staff Dinner, September 27, 2011.

“With the Best of Intentions,” David Rogers Seminar, Cornell University Medical School, September 21, 2011.

“Movements for Occupational and Environmental Health: History and Politics,” Keynote, 4th International Conference on the History of Occupational and Environmental Health,” San Francisco, June 21, 2010.

“Torts and Retorts,” University of Chicago, Pritzker School of Medicine, March 3, 2010.

“Toxic Torts and Retorts: History and the Law,” Café Social Science, Columbia University, New York, January 25, 2010.

Annual Conference, American Public Health Association, November, 2009.

International Symposium on Silicosis, Rome, Italy, October-Nov. 2009.

New Jersey Medical Society, October, 2009.

Yale University Lecture on American Civilization, April 7, 2009.

Swarthmore College, Disaster Preparedness,” April 2, 2009.

Moderator, “Risk Factors and Public Health,” American Association for the History of Medicine, Annual Convention, Rochester, April 10, 2008.

“Trials of a Historian,” University Lecture, University of Wisconsin, February 13, 2008.

“Trials and Tribulations,” Georgia Tech University, March 27, 2008.

Plenary session, “Movements for Public Health,” Annual Conference, American Public Health Association, Washington, Nov. 2007.

“Trials and Tribulations: A Historian in the Courtroom,” Edward and Amalie Kass Lecture, Wellcome Centre for the History of Medicine/University College London, Dec. 10, 2007.\

“The Past and Future of Public Health,” Plenary Presentation, American Public Health Association, Washington, November 4, 2008.

“International Conference on Comparative Approaches to the History of Silicosis,” Ecole des Hautes Etudes en Sciences Sociales, Paris, France, October 26-27, 2007.

“Deceit and Denial,” Herbert H. Lehman Center for American History, Columbia University, Great Books, Series, Feb. 8, 2007.

“Historians in the Crosshairs,” University of California, Los Angeles, December 12, 2006.

“Terrorism and Bioterrorism,” John Jay College, November, 2006.

“Scientific Integrity and Scientific Intimidation,” Society for Environmental Journalists, Burlington, Vt., October, 2006.

Lead and other Heavy Metals, University of Brescia, Brescia, Italy, June, 2006.

Lecture Series, Ecole Des Hautes Etudes en Sciences Social, Pairs, April, 2006.

“Deceit and Denial,” Neilly Series, University of Rochester, March 23, 2006.

“History in the Courtroom,” New York University, Tamiment Seminar in Labor & Social History, March 6, 2006.

“History Matters: Lead Poisoning, Vinyl Chloride, Corporate Power and Environmental Health Policy,” Grand Rounds, Department of Health Policy, Mt. Sinai School of Medicine, February 28, 2006.

“History Matters: Lead Poisoning, Vinyl Chloride, Corporate Power and Environmental Health Policy,” Milwaukee Medical Society, February 21, 2006.

“Lead and the American Environment,” Four Evenings in the History of Science, Columbia University Medical Center, April 24th, 2005.

“Taking Care of Business: Childhood Lead Poisoning and the Politics of Environmental Disease,” Sarah Lawrence College, February 16, 2005.

“Historians and the Chemical Industry,” NYU Forum on Scientific Integrity, February 11, 2005.

“New York Under Construction: Lead in the Urban Environment: ‘Building an Epidemic,’” General Society of Mechanics and Tradesmen, Labor, Literature and Landmarks Lectures, February 1, 2005.

January 11, 2005, “Health, History and the Legal System,” Cornell University Medical School, David Rogers Lecture.

September 15, 2004 “Taking Care of Business: The Deadly Politics of Industrial Pollution,” Fifth Annual Medical Humanities Conference,” University College, London.

May 13, 2004 “Implications of Brown v. Board of Education: Then and Now,” CUNY Graduate Center Symposium on Brown, 50 Years Later.

February 6, 2004, Grand Rounds, Mt. Sinai School of Medicine Department of Community Medicine, “Childhood Epidemics, Environmental Health and the Problem of Counting,” New York City.

October 16, 2003, Carole W. Samuelson Inaugural Lecture in Public Health Practice, University of Alabama School of Public Health, Birmingham.

November 13, 2003, David Rosner and Gerald Markowitz Book Session: Deceit and Denial, Social Science History Association, Baltimore.

November 11, 2003, Distinguished STS/HM lecture, "Trials and Tribulations: Childhood Lead Poisoning and Evaluating the Responsibility for a Public Health Disaster," Ann Arbor, University of Michigan.

September 22, 2003. "Toxic Science: The Lead Industry and the Makings of a Childhood Epidemic," Yale University History of Science Seminar.

September 12, 2003, "September 11 and the Public Health Response," Nashville, Southern Public Health Association Annual Conference.

December 9, 2002, "A History of a Public Health Tragedy," National Alliance against Lead Poisoning, Annual Board Meeting, Washington, D.C.

November 21, 2002, Whitehead Lecture, University of Pittsburgh.

November 6, 2002, Deceit and Denial, talk, Chicago Public Library.

November 4, 2002, "Covering the World with Lead," National Library of Medicine, National Institutes of Health, Bethesda, Md.

October 30, 2002, University Seminar, Brown University, Providence, Rhode Island.

October 12, 2002, "Lead Poisoning in Baltimore," Society of Environmental Journalists, Baltimore, Md.

October 9, 2002, "Covering the Earth with Lead," Johns Hopkins University, Institute for the History of Medicine, Baltimore.

April, 2002, Ida Beam Invited Lectures, University of Iowa, Iowa City.

March, 2002, Childhood Lead Poisoning, A Historical Perspective, Centers for Disease Control, Atlanta.

May 19, 2000, "Cater To the Children," American Association for the History of Medicine, Bethesda, MD.

April 15, 2000, Verne Moore Lecture, University of Rochester, Rochester, New York.

Nov. 1997, "Silicosis, State of the Art," American Public Health Association, Annual Convention, Indianapolis, Indiana.

October 15, 1997, "The Re-emergence of Silicosis," Labor History Conference, Wayne State University, Detroit.

March 26-27, 1997, Panelist, "What's Preventing Prevention?" National Silicosis Conference, sponsored by NIOSH, MSHA, OSHA, Washington, D.C.

November 20, 1996, Honoree of "An Evening With...", the Medical Care Section of APHA discussion of "Race and Social Services for Children," with David Rosner, June Jackson Christmas and Jack Geiger. American Public Health Association Annual Conference, New York.

November 20, 1996, Presenter, Arthur Viseltear Award, American Public Health Association Annual Conference, New York.

November 20, 1996, "The Politics of Abandonment, Race and Mental Health in Post-War New York," American Public Health Association Annual Conference, New York.

May 22, 1996, Occupational Disease Panel, American Industrial Hygiene Association Annual Conference, Washington, D.C.

May 2, 1996, John Lassiter Lecture, "The Politics of Abandonment, Race and Mental Health in Post-War New York," New York Academy of Medicine, New York.

September 16, 1995, "Public Health and Public Accountability," at "Symposium of Hives of Sickness: Public Health and Epidemics in New York City, sponsored by Museum of the City of New York and the New York Academy of Medicine at the Museum, Blue Mountain Lake, New York.

"Tuberculosis and Public Health in New York," opening lecture at the Adirondack Museum for their exhibit on "Tuberculosis in the Wilderness," July 15, 1995 at the Museum.

April 12, 1995, "Between Care and Cure: The Changing Epidemiology of Disease in Major American Cities," at Brooklyn Hospital Sesquicentennial.

March 11, 1995, "The Changing Face of Environmental Justice," American Society of Environmental History, Las Vegas, Nev.

February 9, 1995, "Race and the Politics of Abandonment, New York City in the Post-War Decades," at The Orphan Project, Fund for the City of New York.

November 3, 1994, Presentation of Viseltear Prize, American Public Health Association, Annual Meeting, Washington, D.C.

November 3, 1994, "Psychiatry and Race in New York," American Public Health Association, Annual Meeting, Washington, D.C.

March 9, 1994, "The Problem of Medical Uncertainty," Heberden Society Lecturer, New York Hospital-Cornell Medical Center.

Nov. 30, 1993, "Thresholds and Silica - The Problem of Medical Uncertainty," Second International Conference on Silicosis and Cancer, San Francisco.

Nov. 28, 1993, Chair and Presenter, "The Ambiguous History of the United States Public Health Service," American Public Health Association, Annual Meeting, San Francisco.

Nov. 28, 1993, Presenter of Viseltear Award to James Jones, American Public Health Association, Annual Meeting, San Francisco.

October 13-14, 1993, "The Limits of Thresholds: Silica and the Politics of Science," at Danger, Risk, and Safety: Ideas and Practices, Center for the History of Business, Technology, and Society, Hagley Museum and Library, Wilmington, Delaware.

September 16-17, 1992, "Silicosis and the Politics of Dust," University of Rochester, School of Medicine and Department of History.

May 29, 1992, "A History of Race and Child Labor," Conference on Child Labor, Mt. Sinai School of Medicine, New York City.

March 3, 1992, "Silicosis and Occupational Disease," Harvard University, Department of History of Science and School of Public Health.

October 10, 1991 "Silicosis and the Politics of Industrial Disease," The History of Occupational Safety and Health, Third Labor History Symposium of the George Meany Memorial Archives, Washington, D.C.

Nov. 10, 1991, "Historical Perspective," TeKolste Forum, Indiana Hospital Association, Indianapolis, Indiana.

September 13, 1990, Respondent to talks by Rosemary Stevens and Bruce Vladeck, Health Services Improvement Fund, New York.

August 29, 1990, 17e Congres International Des Sciences Historiques, "Disease and Society, Silicosis and the Social Construction of Occupational Disease," Madrid, Spain.

May 4, 1990, "The Politics of Occupational Disease," Political Science "Friday Forum," CUNY Graduate Center.

March 30, 1990, George Rosen Lecturer, Yale University Medical School and Beaumont Medical Club, New Haven.

Jan. 1990, Chair, "Medicine and Difference: Comparative Perspectives," American Historical Association, Annual Meeting, New York.

Nov. 9, 1989, "The Masking and Unmasking of Industrial Disease," Institute of the History of Medicine, Johns Hopkins University, Baltimore.

Nov. 3, 1989, "An Evening with David Rosner," The Graduate Program in Health Care Administration, Simmons College.

Nov. 17, 1989, "Silicosis and Social Construction," Anthropology Department, CUNY Graduate Center.

January, 29 1989, "Discovering Workers' Lung Diseases: Lay and Medical Perceptions of Pneumoconiosis," New York Academy of Sciences, (Section on History and Philosophy of Science)

August 14-18, 1988, "Voluntary Providers of Health Care in New York City," The Institute of History of the Hungarian Academy of Science, Third Meeting of American and Hungarian Historians, Budapest, sponsored by IREX, the ACLS and the Hungarian Academy.

May 12, 1988, "The Technology of Medical Uncertainty," Massachusetts Institute of Technology, Dept. of Political Science, Cambridge.

May 5, 1988, "Unions, Employees and the Rise of Third Party Payment," Kellogg Seminar in Health Policy, Advanced Management Program for Clinicians, NYU.

June 7, 1987, "Workers Health and Benefit Plans," Wellcome Institute for the History of Medicine, University College, London.

January 29, 1986, "The Ambiguous Relationship: Public Health, Public Policy and Workers' Lives," New York Academy of Sciences.

February 22, 1986, "Hostile or Hostel? The Hospital in the Nineteenth Century," at Woman in Medicine Exhibition, New York Academy of Medicine.

October 23-25, 1986, "Safety and Health During the New Deal," North American Conference on Labor History, Toronto.

January 29, 1986, "The Ambiguous Relationship: Public Health, Public Policy and Workers' Lives," New York Academy of Sciences (Section on History and Philosophy of Science).

April 10, 1985, University of Wisconsin, Madison, University Lecture, "Leaded Gas and the Public Health Debates of the 1920s,".

Nov. 12, 1985, "The Changing Hospital-Lessons for Administrators", American Public Health Association, Annual Meeting.

Nov. 13, 1984, "A Gift of God', The Tetra Ethyl Lead Controversy in the 1920s," American Public Health Association Annual Meeting.

Nov. 4-5, 1984, "What's Our Line?: The Changing Direction of Health Administration Education," The Wood Institute Conference, The College of Physicians of Philadelphia.

Nov. 3-4, 1983, Perspectives on Safety and Health, Rockefeller Foundation-Carnegie Mellon University, Conference on Applied Uses of Historical Research.

May 3, 1983, "Hospitals and Health Care," Harvard University, School of Medicine and Graduate School of Arts and Science.

April, 1983, "Perspectives on Financing of Hospitals," New York City Office of Management and Budget Study Group.

Feb. 17, 1983, "Hospital Care and Conflict," Metropolitan Medical Anthropological Association, New School for Social Research.

Nov. 14, 1982, "The Committee on the Costs of Medical Care Today," American Public Health Association, dinner in honor of C. Rufus Rorem, I.S. Falk, Agnes Brewster and Margaret Klem, Montreal.

October 21, 1982, "Management and Charity in Conflict, The Origins of the American Hospital," New York University, Health Care Seminar.

May, 1982, "Historical Perspective on Hospital and Health Care," Association of University Programs in Health Administration, Annual Convention.

April 29, 1982, "Hospitals and the American Physician," "Grand Rounds," George Washington University Medical School,.

Dec. 7, 1981, "Hospital and Patient Care: The Changing Relationship," Harvard University, School of Public Health

Nov. 7, 1981, "Ideas for New Directions", Regional Historians Conference, Bard College, Poughkeepsie.

Nov. 1, 1981, "Hospitals and History: New Directions and New Ideas," History and Public Health Committee of Medical Care Section, American Public Health Association, Los Angeles.

Oct. 6, 1980, "The Physician of the Future," Medical Care Seminar Series, Sickroom Seminar Series, Milwaukee.

March 3-5, 1980, "The Hospital in Transition," Medical Care Seminar, National Health Policy Forum, Charleston, South Carolina.

Nov. 7, 1979, "Role and Evaluation of Profit-Making in the Health Care Industry," American Public Health Association, Annual Convention, New York Sheraton.

May 5, 1979, "Political Change and Hospital Governance," American Association for the History of Medicine, Convention, Pittsburgh.

March 14, 1979, "Hospitals and Health Care in the Progressive Era City," Massachusetts Institute of Technology, Seminar on Science and Society.

Dec. 13, 1978, "Health Care in Transition: The Urban hospital in 19th and Early 20th Century America," Columbia University Seminar in Social and Preventive Medicine.

May 16, 1978, "Demographic Change and the Organization of Health Services," Columbia University Seminar on the City.

September 7, 1978, "Historical Perspectives on the Governance of Hospitals," Conference on Hospital Governance, Governor's Health Advisory Council, Albany.

April, 1978, "From Charity to Industry: Hospital Management and Historical Change", Organization of American Historians, New York City.

April 11, 1977, "Urban Reform and Management Ideals: Brooklyn Hospitals During the Progressive Era," Morris Fishbein Center, University of Chicago, .

October 15, 1976, "The Development of the Modern Hospital," Milbank Seminar Series, Boston University.

May 2, 1975, "Boston's Health Care System During the Progressive Era: Changing Patters of Service and Delivery," American Association for the History of Medicine, Annual Convention, Philadelphia, Pa.

Other Presentations

Universities: University of Chicago, Wisconsin, Michigan, Harvard, Columbia, NYU, Johns Hopkins, Yale, Tufts, Bryn Mawr, George Washington, Boston University, Boston College, Cornell University School of Medicine, New School, Massachusetts, Case Western Reserve, MIT, CUNY (virtually all campuses), New York Hospital- Cornell Medical School, Downstate Medical Center, Mt. Sinai School of Medicine, Albert Einstein College of Medicine, Sarah Lawrence, SUNY-(Buffalo, Binghamton, Albany, Stony Brook), Union College, University College, London, University of Rochester, Science Po, Ecole des Hautes Etudes en Sciences Sociales, Yale, Princeton, etc.

Professional Meetings: New York Academy of Medicine, New York Academy of Science, American Public Health Association (12), American Historical Association(2), Organization of American Historians (3), Milbank Roundtable, American Association for the History of Medicine (3), United Hospital Fund (3), Blue Cross Health Services Improvement Fund (2), New York Anthropological Association, Columbia University Seminars (5), International Congress of the Historical Sciences, TeKolste Forum, Indianapolis, American Anthropological Association Annual Meeting, The Orphan Project, American Association of Environmental History (2), etc.

Peer Reviews for Scholarly Journals [selection]

Journal of American History
Milbank Memorial Quarterly
Journal of Social History
Medical Care
American Journal of Public Health
Journal of the History of Medicine
Bulletin of the History of Medicine
Women and Health
Journal of Public Health Policy
Public Health Reports
Journal of Urban History
Journal of Interdisciplinary History
Environmental History Review
Health PAC Bulletin
Medical History (England)
Journal of Health Politics, Policy and Law
American Historical Review

And others.

Manuscripts for University Presses

Harvard University Press
Duke University Press
University of North Carolina Press
Cambridge University Press
Indiana University Press
Princeton University Press
Cornell University Press
Temple University Press
Yale University Press

University of Pennsylvania Press
Oxford University Press
Johns Hopkins University Press
Rutgers University Press
University of Wisconsin Press
Columbia University Press
University of Pittsburgh Press
University of Rochester Press
Duke University Press
University of Michigan Press
Ohio University Press
And others

Grant Reviewer:

National Library of Medicine, NIH
National Endowment for the Humanities
Interpretive Research Division
Archive and Museum
Documentary
Agency for Health Services Research, U.S. Department of Health and Human Services
National Academy of Sciences
Commonwealth Foundation
National Science Foundation.
National Institutes of Health

Editorial Boards:

Editorial Board, Journal of Public Health Policy 1995-present
Contributing Editor, Public Health Reports, 2003-present
Guest Editor, Journal of Public Health Policy, Summer, 2003
Guest Editor, Journal of Health Policy, Politics and Law, 1990.
Women and Health (History Editor), 1986-1998
Associate Editor for Health and Science, Encyclopedia of New York City (Yale University Press, 1995; 2006)
Editorial Board, Health PAC Bulletin, 1980-1985
University of Rochester Press, Consulting Editor, Series on the History of Public Health, 1999- present.
Editorial Board, Bulletin of the History of Medicine, 2015-2019.

Television, Radio

“The People vs. Dutch Boy Lead,” *The Takeaway*, National Public Radio,
<https://www.wnycstudios.org/story/the-stakes-people-vs-dutch-boy-lead> , April 23, 2019.
German Public Radio, 2018.
Moyers & Co. Interview with David and Jerry (April 2013)
Interview on Baltimore Public Radio May 1, 2013: http://programs.wypr.org/podcast/lead-wars-wednesday-may-1-12-1-pm?quicktabs_1=0
The Leonard Lopate Show, (<http://www.wnyc.org/story/290662-lead-wars-hem-performs-live-mars-rover-nadeem-aslams-new-novel/>)
WNYC News, NPR, “deBlasio Flagged Lead Problem in Public Housing,
<http://www.wnyc.org/story/public-advocate-de-blasio-flagged-lead-problem-nycha/> WNYC, March 18, 2016:
[Marketplace](#): Lead May be the Biggest Childhood Epidemic: Feb. 1, 2016.

[Keystone Crossroads](#) "Lead Paint was Banned 40 Years Ago." February 26, 2016
[Morning Edition News Break](#) March 18, 2016.
[Fresh Air Interview](#) March 3, 2016. **Transcript:** n
[The Current](#) (Canadian Broadcasting Company) January 22, 2016.
[RN](#) - Australian Broadcasting Company March 14, 2016.
[Radio Lab "Patient Zero"](#) NPR, March 28, 2018.
[The Open Mind: Poisoning America](#) April 25, 2016.
[CCTV: David Rosner on Lead Poisoning](#) 2017.
[WNYC: As Public Advocate, de Blasio Flagged Lead](#) Mar 18, 2016.
National Public Radio, "Tell Me More," September, 2009.
WNYC, Leonard Lopate Show, Nov. 19, 2002. <https://www.wnyc.org/story/47911-david-rosner-and-terry-markowitz/> .
National Public Radio, "All Things Considered," May, 2005
National Public Radio, "Talk of the Nation" with Neil Conan, May 2, 2005.
"Air America" 2005.
"Reportage Without Frontiers," Greek National Television, 2003.
WBAI, 2004
CNN, 2004.
WAMC,(Roundtable with Susan Arbetter) WBUR (Here & Now), WNYC (New York and Company),
NPR (Living on Earth)WPNR(Tom Pope Show) (October-November 2002), WBAI (2002)
PBS (March 26, 2001) interviewed by Bill Moyers, in [Trade Secrets](#).
"Blue Vinyl," on HBO, June, 2002.
Canadian Public Radio, "This Morning," April 26, 1999.
British Broadcasting Corporation (BBC 4), April 13, 1999; January, 2007.
TBS Special on Infectious Disease Epidemics (1997)
National Public Radio - "All Things Considered" (1996)
Spanish National Television (1994)
Greek Television, (2004).
PrimeTime Live (ABC) (1992)
Canadian Public Radio (1991)
Fox 5, New York City (1997)
National Public Radio - "All Things Considered –Weekend Edition," (1990)
Various local radio in New York, Philadelphia, New York State, California, Utah.

Doctoral Committees and Dissertation Reviews

New York University,
Department of History
Columbia University,
Department of History
School of Public Health
Temple University
Department of History
Rutgers University
Department of History
SUNY Binghamton
Department of History

And many others

Other Consulting

Law Firms

Weil, Gotshal and Manges
Provost & Umphrey
Wilentz, Goldman & Spitzer
Cook & Butler
Peter G. Angelos, Baltimore
Motley Rice, Charleston
New York City Law Department
State of Rhode Island
City of Chicago
City of St. Louis
Cities of San Francisco, San Diego, Oakland, Berkeley, San Jose, Los Angeles
Baron & Budd
Waters & Kraus

And many others

Museum, Colleges and Academies

American Museum of Natural History
New York Historical Society Advisory Committee
Museum of the City of New York
Adirondack Museum
Brooklyn (LI) Historical Society
New York Academy of Medicine
Department of Medical Humanities
Downstate Medical College
Tenement Museum, New York City
Brooklyn Historical Society
Green-Wood Cemetery
National Governors Association

And others

Deposition and Trial Testimony

Since 1993 David Rosner has provided numerous depositions and trial testimony in cases involving silicosis, asbestosis, vinyl chloride exposures, PCBs and lead. He has provided testimony and affidavits on behalf of private plaintiffs, injured workers, state and local government agencies in childhood lead poisoning cases, including New York City, Rhode Island, cities in California, and Milwaukee. A list of depositions and trial testimony over the past five years is available upon request.

EXHIBIT D

Curriculum Vitae

Gerald E. Markowitz Distinguished Professor of History

John Jay College of Criminal Justice
524 West 59 Street, NY, NY 10019
(212) 237-8458
gmarkowitz@jjay.cuny.edu

Born: 12 July 1944

Education: B.A., Earlham College, 1965
M.A., University of Wisconsin, 1967
Ph.D., University of Wisconsin, 1971

Employment:

Distinguished Professor of History, John Jay College and Graduate Center, City University of New York, 2004 - present
Professor of History, John Jay College, City University of New York, 1970 - present
Professor of History, Graduate School and University Center, CUNY, 1990 - present
Chair, Interdepartment of Thematic Studies, John Jay College, 1985-1987, 1989-1992, 1995-1999
Adjunct Professor of Sociomedical Sciences, Mailman School of Public Health, Columbia University, 2002 - present

Books:

Lead Wars: The Politics of Science and the Fate of America's Children (with David Rosner) (Berkeley: University of California Press/ Milbank Memorial Fund, 2013)

The Contested Boundaries of Public Health, (co-edited with James Colgrove and David Rosner), Rutgers University Press, 2008.

Are We Ready? Public Health Since 9/11 (with David Rosner) (Berkeley: University of California Press/ Milbank Memorial Fund, 2006).

Deadly Dust: Silicosis and the On-Going Struggle to Protect Workers' Health (New and Expanded edition) (with David Rosner) (Ann Arbor: University of Michigan Press, 2006).

Deceit and Denial: The Deadly Politics of Industrial Pollution, (with David Rosner), Berkeley: University of California Press/Milbank Memorial Fund, 2002; paper, 2003; new expanded edition, 2012)

Children, Race, and Power: Kenneth and Mamie Clarks' Northside Center, (with David Rosner), (Charlottesville: University Press of Virginia, 1996; Paperback: New York: Routledge, 2000)

World Civilizations, Sources, Images, and Interpretations, volumes 1 and 2 (ed. Western Hemisphere selections) (NY: McGraw Hill, Inc, 1994, 4th edition, 2005).

Deadly Dust: Silicosis and the Politics of Industrial Disease in Twentieth Century America, (with D. Rosner), (Princeton: Princeton University Press, 1991; paperback ed. Fall 1994). (Noted as an "Outstanding Academic Book of 1991" by Choice).

"Slaves of the Depression": Workers Letters About Life on the Job (Ithaca: Cornell University Press, 1987,) (ed. with D. Rosner)

Dying for Work: Workers' Safety and Health in Twentieth Century America (ed. with D. Rosner) (Bloomington: Indiana University Press, 1987; paperback ed. 1989). (Noted as an "Outstanding Academic Books of 1987" by Choice).

Democratic Vistas: Post Offices and Public Art in the New Deal, (Philadelphia: Temple University Press, 1984) (with M. Park).

New Deal for Art (Hamilton, N.Y.: Gallery Association of New York State, 1977) (with M. Park).

The Anti-Imperialists, 1898-1902 (New York: Garland Publishing, Inc., 1976).

Articles and Review Essays

“‘Nondetected’: The Politics of Measurement of Asbestos in Talc, 1971-1976,” American Journal of Public Health, 109 (July 2019), 969-974. (With D. Rosner and M. Chowkwanyun).

“Monsanto, PCBs, and the Creation of a ‘World-wide Ecological Problem,’” Journal of Public Health Policy, 39, 4 (November 2018), 463-540. (With D. Rosner)

“From Industrial Toxins to Worldwide Pollutants: A Brief History of Polychlorinated Biphenyls,” Public Health Reports, 133 (2018), 721-725.

“ToxicDocs (www.ToxicDocs.org): From History Buried in Stacks of Paper to Open, Searchable Archives Online,” Journal of Public Health Policy, 39 (January 2018), 4-11 (Guest Editorial, with D. Rosner and M. Chowkwanyun)

[special section] “ToxicDocs: Opening a New Era of Evidence for Policies to Protect Public Health” (Guest Eds. Rosner D, Markowitz G, Chowkwanyun M). Journal of Public Health Policy, 39 (2018) <https://doi.org/10.1057/s41271-017-0106-8>.

“‘Ain’t Necessarily So!’: The Brake Industry’s Impact on Asbestos Regulation in the 1970s,” American Journal of Public Health, 107 (September 2017), 1395 - 1399 (with David Rosner).

“The Childhood Lead Poisoning Epidemic in Historical Perspective,” Endeavour, 40 (June 2016), 93-101 .

“‘Unleashed on an Unsuspecting World’: The Asbestos Information Association and Its Role in Perpetuating a National Epidemic,” (with D. Rosner), American Journal of Public Health, 106 (May, 2016), 834-840.

“Building the World That Kills Us: The Politics of Lead, Science, and Polluted Homes, 1970 to 2000,” Journal of Urban History, 42 (March 2016), 323 - 345. (With D. Rosner)

“‘Educate the Individual . . . to a Sane Appreciation of the Risk’: A History of Industry’s Responsibility to Warn of Job Dangers Before the Occupational Safety and Health Administration,” American Journal of Public Health, 106 (January 2016), No. 1, pp. 28-35. (with David Rosner)

“Persistent Pollutants: A Brief History of The Discovery of the Widespread Toxicity of Chlorinated Hydrocarbons,” (with David Rosner) Environmental Research, 120 (January 2013), 126-133.

“With the Best Intentions, Lead Research and the Challenge to Public Health,” American Journal of Public Health, (with D. Rosner) November 2012, Vol. 102, No. 11, pp. e19-e33.

“From the Triangle Fire to the BP Explosion: A Short History of the Century Long Movement for Safety and Health,” New Labor Forum, 20 (Winter 2011), 26-32. (With D. Rosner)

“The Historians of Industry,” [with D. Rosner] Academe, 96 (November-December 2010), 28-33.

The Trials and Tribulations of Two Historians,” [with D. Rosner], Medical History, 53 (April, 2009), 271-292.

“L’Histoire au Pretoire aux Etats-Unis,” Revue d’histoire Moderne et Contemporaine, [with D. Rosner] (January-March, 2009), 227-252.

“Vinyl Chloride Propellant in Hair Spray and Angiosarcoma of the Liver Among Hairdressers and Barbers: Case Reports,” [with P. Infante, et. al.] International Journal of Occupational and Environmental Health, 15 (Jan/Mar 2009), 36-42.

“‘A Problem of Slum Dwellings and Relatively Ignorant Parents’: A History of Victim Blaming in the Lead Pigment Industry,” Environmental Justice, I, 3 (2008), 159-168 (with D. Rosner)

“The Politics of Lead Toxicology and The Devastating Consequences for Children,” American Journal of Industrial Medicine, 50 (2007), 740-756. (With D. Rosner)

“The Virus Scare,” Reviews in American History, 33 (December 2005), 566 - 573.

“Standing up to the Lead Industry: An Interview with Herbert Needleman,” Public Health Reports, 120 (May-June 2005), 330-337. (With D. Rosner)

“J. Lockhart Gibson and the Discovery of the Impact of Lead Pigments on Children’s Health: A Review of a Century of Knowledge,” Public Health Reports, 120 (May-June 2005), 296-300. (With D. Rosner and B. Lanphear)

“Uncovering a Deadly Cancer: The National Implications of Revelations at the B.F. Goodrich Plant in Louisville,” The Register of the Kentucky Historical Society, 102 (Spring 2004) 157-181. (With D. Rosner)

“Emergency Preparedness, Bioterrorism, and the States: The First Two Years after September 11,” Milbank Memorial Fund Publications, (New York: Milbank Memorial Fund, 2004), 78 pp. (With D. Rosner)

“Politicizing Science: The Case of the Bush Administration’s Influence on the Lead Advisory Panel at the Centers for Disease Control,” Journal of Public Health Policy, 24 (2003), 105-129. (With D. Rosner)

“September 11 and the Shifting Priorities of Public and Population Health in New York,” Milbank Memorial Fund Publications, (New York: Milbank Memorial Fund, 2003), 58 pp. (With D. Rosner)

“Cursed Bugiardi,” (“Damn Liars”) (Translated in Italian) (with D. Rosner), Epidemiologia & Prevenzione, 27 (January- February, 2003)

“The Struggle over Employee Benefits: The Role of Labor in Influencing Modern Health Policy,” The Milbank Quarterly, 81 (2003), 45 - 74. (With D Rosner)

“Industry Challenges to the Principle of Prevention in Public Health: The Precautionary Principle in Historical Perspective,” Public Health Reports, 117 (November/ December 2002), 501-512. (with David Rosner)

“Corporate Responsibility for Toxins,” The Annals of the American Academy of Political and Social Science, issue devoted to “Health and the Environment,” 584 (November 2002), 159-174. (with David Rosner)

“Il Cloruro di Vinile e l’Industria Chimica in America e in Europa: ‘le Prove di una Conspirazione Illegale delle Imprese,’” (“Vinyl Chloride and the American and European Chemical Industry: ‘Evidence of an Illegal Conspiracy by Industry’”) (Translated in Italian) (with David Rosner) Epidemiologia & Prevenzione, 25 (Luglio-Ottobre, 2001), 191-203.

“‘A Little of the Buchenwald Touch’: America’s Secret Radiation Experiments,” Reviews in American History, 28, 4 (December 2000), 601-606.

“‘Cater to the Children’ The Role of the Lead Industry in a Public Health Tragedy, 1900-1955,” (with D Rosner), American Journal of Public Health, 90 (January, 2000), 36-46.

“Labor Day and the War on Workers,” American Journal of Public Health (with David Rosner), 89 (September 1999), 1319-1321.

“C.-E. A. Winslow: Scientist, Activist, and Theoretician of the American Public Health Movement throughout the First Half of the Twentieth Century - Commentary,” Journal of Public Health Policy, 19 (1998), 154-159.

“The Reawakening of National Concern about Silicosis,” (with D. Rosner), Public Health Reports 113 (July/August 1998), 302-311.

“Hazardous History: Researching the Dangerous Trades,” Reviews in American History, 26 (June 1998), 408-414.

“Hospitals, Insurance and the American Labor Movement,” Journal of Policy History, (with D. Rosner), 9 (1997), 74-95..

“Race, Foster Care and the Politics of Abandonment in New York City,” American Journal of Public Health, 87 (November 1997), 1844-1849.

“Workers, Industry, and the Control of Information: Silicosis and the Industrial Hygiene Foundation,” (with D. Rosner), Journal of Public Health Policy, 16(Spring, 1995), 29-58.

“The Limits of Thresholds, Silica and the Politics of Science, 1935-1990,” (with D. Rosner), American Journal of Public Health, 85 (February, 1995), 253-262.

“Race and Foster Care,” (with D. Rosner), Dissent, (Spring, 1993), 233-237.

“Consumption, Silicosis and the Social Construction of Industrial Disease,” (with D. Rosner) Yale Journal of Medicine and Biology, 64 (Fall, 1991), 481-498.

“Seeking Common Ground: Blue Cross and Labor in Post-War America,” Journal of Health Politics, Policy and Law, (with D. Rosner) 16 (Winter, 1991), 695-718.

“Expert Panels and Medical Uncertainty,” (with D. Rosner), American Journal of Industrial Medicine, (Winter, 1990-91), 131-134.

“Street of Walking Death,” (with D. Rosner), Journal of American History, 77(September, 1990), 525-552. ("reprinted" in CD-ROM by McGraw Hill).

“The Illusion of Medical Certainty, Silicosis and the Politics of Industrial Disease,” (With D. Rosner) Milbank Quarterly, (Supplement 2, 67 (1989)pp. 228-253) (revised and reprinted in Framing Disease, ed. by Charles Rosenberg and Janet Golden (Rutgers University Press), 1991).

“Death and Disease in the House of Labor,” (With D. Rosner), Labor History, 30(Winter, 1989), pp.113-117.

“More than Economism: The Politics of Workers' Safety and Health, 1932-1947,” The Milbank Quarterly, 64 (Summer 1986), 331- 354. (with D. Rosner).

“Poison at the Pump,” (with D. Rosner) Thesis (Fall, 1986), 22-29. (Awarded a Silver Medal for “Best Articles of the Year,” by the Council for the Advancement and Support of Education.)

“A ‘Gift of God’? The Public Health Controversy over Leaded Gasoline During the 1920s,” American Journal of Public Health, 75 (April 1985), 344-352. (with D. Rosner).

“Research or Advocacy: Federal Occupational Safety and Health Policies During the New Deal,” Journal of Social History, 18 (March, 1985), 365-381. (with D. Rosner).

“Safety and Health as a Class Issue: The Workers' Health Bureau of America, 1921-1927,” Science and Society, 48 (Winter, 1984/85), 466-482. (with D. Rosner).

“A Case Study in Conservation: Max Spivak's Murals of Puppets and Circus Characters in the Children's Room of the Astoria Branch of the Queens Borough Public Library,” in Art for the People -- New Deal Murals on Long Island, ed. by David Shapiro (Hempstead, New York, 1978). (with M. Park)

“Progressivism and Imperialism: A Return to First Principles,” The Historian, 37 (February, 1975), 257-275.

“Doctors in Crisis: a Study of the Use of Medical Education Reform to Establish Modern Professional Elitism in Medicine,” American Quarterly, 25 (March 1973), 83-107. (with D. Rosner)

Chapters in Books:

“Why Is Silicosis So Important,” Chapter 1 of Silicosis: A World History, ed., Paul-Andre Rosental, Baltimore: John Hopkins University Press, 2017 (With David Rosner), pp. 14-29.

“‘An Injury to One is an Injury to All’: Movements for Occupational and Environmental Health in Twentieth-Century America,” in Paul D. Blanc and Brian Dolan, editors, At Work in the World: Proceedings of the Fourth International Conference on the

History of Occupational and Environmental Health (San Francisco: University of California Medical Humanities Press, 2012), 40 - 55. (With D. Rosner)

“Introduction: The Contested Boundaries of Public and Population Health,” The Contested Boundaries of Public Health, (co-edited with James Colgrove and David Rosner), Rutgers University Press, 2008 (with James Colgrove and David Rosner)

“The Challenge of 9/11 to the Ideologies of Population and Public Health,” The Contested Boundaries of Public Health, (co-edited with James Colgrove and David Rosner), Rutgers University Press, 2008 (with David Rosner)

“‘Plastic Coffin’: Vinyl Chloride and the American and European Chemical Industry,” in Marie C. Nelson, Occupational Health and Public Health: Lessons from the Past— Challenges for the Future Stockholm: Arbetslivsinstitutet, National Institute for Working Life, 2006) (with D. Rosner)

“Building a Toxic Environment: Historical Controversies over the Past and Future of Public Health,” in Rosemary A. Stevens, Charles E. Rosenberg, and Lawton R. Burns, History and Health Policy in the United States: Putting the Past Back In (New Brunswick: Rutgers University Press, 2006) (with D. Rosner)

“Corporate Responsibility for Toxins,” [reprint of article cited above], in Leslie King and Deborah McCarthy, Environmental Sociology: From Analysis to Action (Lanham, MD: Rowman & Littlefield, 2005) (with D. Rosner)

“Silicosis and the On-Going Struggle to Protect Workers’ Health,” in Vernon Mogensen, ed. Occupational Safety and Health in a Deregulated World, (Armonk, N.Y.:M.E. Sharpe, 2005) (with D. Rosner)

“States in the War Against Bioterrorism: Reactions to the Federal Smallpox Campaign & the Emergency Health Powers Model Act,” (with D. Rosner), in Daniel Lee Kleinman, Abby J. Kinchy, and Jo Handelsman, eds. Controversies in Science and Technology: From Maize to Menopause (Madison: University of Wisconsin Press, 2005), pp. 297-310.

“The History of the Lead Industry’s Promotion of White Lead Paints,”[with D. Rosner], in New York State Bar Association, Lead Paint Poisoning Prevention and Litigation, (New York: NYSBA, 2002) pp. K-1-K-56.

“From Dust to Dust: The Birth and Re-Birth of National Concern about Silicosis,” in Illness and the Environment: A Reader in Contested Medicine (with D. Rosner), ed. by Steve Kroll-Smith, Phil Brown, and Valier J. Gunter (New York: New York University Press, 2000), 162-174.

“Hospitals, Insurance, and the American Labor Movement,” in Health Care Policy in

Contemporary America, (with D. Rosner), ed. By Alan I. Marcus and Hamilton Cravens (University Park: The Pennsylvania State University Press, 1997), 74-95.

"Occupational Disease," Cambridge History and Geography of Disease (with David Rosner), (New York: Cambridge University Press, 1993) 187-192)

"The Illusion of Medical Certainty, Silicosis and the Politics of Industrial Disease," (with D. Rosner), in Framing Disease, ed. by Charles Rosenberg and Janet Golden, (Rutgers University Press, 1992), revised from Milbank article.

"Deadly Fuel, Leaded Gasoline and the Growth of the Automobile Industry," in William Graebner, True Stories, (New York: McGraw-Hill, 1992), 126-141; (second edition, 1996, third edition, 2003).

"New Deal for Public Art," in Critical Issues in Public Art: Content, Context, and Controversy ed. by Harriet F. Senie and Sally Webster (New York: Harper Collins, 1992), 128-141 (with Marlene Park) (Revised and republished, Washington D.C.: Smithsonian Institution Press, 1998.)

"Workers' Health and Safety - Some Historical Notes," (with D. Rosner), Introduction to Dying for Work, Workers' Safety and Health in Twentieth Century America, (Bloomington: Indiana University Press, 1987), pp.ix-xx.

"Safety and Health as a Class Issue: The Workers' Health Bureau of America, During the 1920s," in Rosner and Markowitz, eds. Dying for Work, Workers' Safety and Health in Twentieth Century America, (Bloomington: Indiana University Press, 1987), pp.53-63. (Revised from previously published article).

"Research or Advocacy: Federal Occupational Safety and Health Policies During the New Deal," in Rosner and Markowitz, eds. Dying for Work, Workers' Safety and Health in Twentieth Century America, (Bloomington: Indiana University Press, 1987), pp. 83-102.(Revised from previously published article).

"'A Gift of God'?" The Public Health Controversy over Leaded Gasoline," in Rosner and Markowitz, eds. Dying for Work, Workers' Safety and Health in Twentieth Century America, (Bloomington: Indiana University Press, 1987), pp. 121-139. (Revised from previously published article).

Introduction to Gerald Markowitz and David Rosner, "Slaves of the Depression, Workers' Letters About Life on the Job, (Ithaca: Cornell University Press, 1987), pp.1-16.

"Safety and Health During the Progressive Era," (with D. Rosner) J. Leavitt and R. Numbers, Sickness and Health in America, 2nd edition, 1986, pp.507-521.

Grants:

Major Grant, New York Council for the Humanities, 2010, “Justice and Injustice in America: The 1950s,”

Principal Investigator (with D. Rosner), National Science Foundation Research Grant, 2008-2010, “The Quandary of Environmental Research: A History of Lead, Children, and Scientific Investigation 1970-2000.”

Principal Investigator, (with D. Rosner) Robert Wood Johnson Foundation, Independent Investigators Award, 2003-2006 “The UN-Natural History of Disease.”

Principal Investigator, (with D. Rosner) Milbank Memorial Fund, 2002-2004, “The Impact of September 11 on the Public Health Infrastructure.”

Principal Investigator (with D. Rosner), National Science Foundation Research Grant, 2001-2002, “Power and Pollution: the Politics of Industrial Disease.”

Principal Investigator (with D. Rosner), National Endowment for the Humanities Interpretive Research Grant, 1992-1994, "Race, Mental Health and Youth, 1946-1976."

Principal Investigator (with D. Rosner), The Winthrop Group, 1992-1993, “Northside, Mental Health and Race.”

Principal Investigator, National Endowment for the Humanities, Interpretive Research grant, 1987-1989, for a history of occupational safety and health in America (with David Rosner).

Principal Investigator, Milbank Memorial Fund, 1985-86, Grant for a history of occupational safety and health in America (with David Rosner).

PSC-CUNY Faculty Grant, 1983-84, 85-86, 87-88, 88-89, 92-93, 97-98, 98-99 for a history of occupational safety and health in the United States, and for a history of race and mental health in New York City..

PSC-CUNY Faculty Grant, 1980-81 for a history of murals and sculpture done under the patronage of the federal government during the New Deal.

Allowing 50% released time from teaching in 1975-76 academic year to research, assemble an exhibition and write a catalog, New Deal for Art. The work was funded by the National Endowment for the Humanities, Public Programs Division and the Gallery Association of New York State.

In conjunction with the exhibition, the New York State Council on the Humanities funded several public panels, which I helped plan and moderated.

Media:

Interviewed for *RADIO TIMES, WHYY Radio, Philadelphia NPR, June 6, 2013.

Interviewed for THE JEFFERSON EXCHANGE/Jefferson Public Radio, Ashland, OR, June 6, 2013

Featured on MOYERS & COMPANY, PBS, May 17-19, 2013

Airing: <http://billmoyers.com/segment/david-rosner-and-gerald-markowitz-on-toxic-disinformation>

Interviewed for CULTURE SHOCKS/Synd. Radio, May 15, 2013 with Barry Lynn

Interviewed for THE TAVIS SMILEY SHOW/Synd. Radio, May 17, 2013

<http://www.tavissmileyradio.com/gerald-markowitz-lead-wars/>

Interviewed for THE LEONARD LOPATE SHOW/WNYC (NPR), May 2, 2013

<http://www.wnyc.org/shows/lopate/2013/may/02/lead-wars/>

Interviewed for OLD MOLE VARIETY HOUR, KBOO, Portland, OR, May 2, 2013

Interviewed for MIDDAY WITH DAN RODRICKS/WYPR Radio (local NPR), May 1, 2013,
<http://www.wypr.org/podcast/lead-wars-wednesday-may-1-12-1-pm>, May 1,

Featured in “Thomas Midgley: a Cautionary Tale,” Radio 4 FM, BBC, January 10, 2007

Interviewed for Leonard Lopate’s “New York and Company,” WNYC, New York, September 19, 2006

Interviewed for the “Arlene Violet Show” WHJJ radio, Providence, Rhode Island, May 6, 2003

Interviewed for “Health Talk with Dr. Ronald Hoffman,” WOR, New York, February 27, 2003.

Interviewed for Leonard Lopate’s “New York and Company,” WNYC, New York, November 19, 2002.

Interviewed for radio station KPFK, Los Angeles, November 7, 2002.

Interviewed for ABC Radio, Washington, D.C., October 11, 2002.

Interviewed for Reportage without Frontiers, a 60 minute weekly television program on the Public Greek Radio Television-NET, September 2002.

Consultant and “Talking Head” for Blue Vinyl an HBO documentary by Judith Helfand and Dan Gold, May 2002.

Featured “Talking Head” for Trade Secrets, A PBS Documentary by Bill Moyers, March 2001.

National Library of Medicine, “History and Public Health,” Bethesda, Maryland, Exhibit featuring Deadly Dust, Dying for Work, and other quotations from my work, 1997.

Miscellaneous:

“An Enormous Victory for Public Health in California: Industries are Responsible for Cleaning up the Environments They Polluted,” Editorial, American Journal of Public Health 109 (February 2019), 211-212.

Rachel Carson Award, “In recognition of your outstanding success and distinction in the environmental health and safety profession,” American Industrial Hygiene Association, May 2018

Elected Member, National Academy of Medicine, National Academies of Science, 2017

“Workers’ Health on the Chopping Block,” Huffington Post online, June 30, 2017, (with D. Rosner and R. Bayer), available at: http://www.huffingtonpost.com/entry/workers-health-on-the-chopping-block_us_5956431be4b0326c0a8d0f70?ncid=engmodushpimg00000006

Award for “Outstanding Scholarship on the History of Work and Health: from the International Commission on Occupational Health,” (With David Rosner) The Scientific Committee on the History of Prevention of Occupational and Environmental disease. Gothenburg, Sweden, March 31, 2017.

“Citizen Scientists and the Lessons of Flint,” Milbank Quarterly Online Exclusive, <http://www.milbank.org/quarterly/articles/citizen-scientists-lessons-flint/> (with D. Rosner), 2016.

“Welcome to the United States of Flint,” Tomgram: <http://www.tomdispatch.com/blog/176101/>; Re-posted on Commondreams.org; thenation.com, huffingtonpost.com, truthout.org; ecowatch.com; lemondediplomatique.com; pej.com; seriouslypolitics.com; historynewsnetwork.org and others. (With D. Rosner), 2016

“Beyond the Call of Duty Award,” Childhood Lead Action Project, Providence Rhode Island, November 2014

“Industry’s Relationship to Science,” Theater for the New City, New York, NY October 16, 2014.

“Lead and the Philadelphia Tooth Fairy Project,” Philly.com, November 4, 2013, at http://www.philly.com/philly/blogs/public_health/The-Philadelphia-Tooth-Fairy-Project.html#txQPk6SzsV4qiWlC.99

“America Is Poisonous to Your Health,” Salon on line, April 28, 2013, http://www.salon.com/2013/04/29/christie_3_partner/ (Reprinted from TomDispatch.com and re-posted on many websites)

“The Donna Frye Spirit of Justice Award,” Environmental Health Coalition, San Diego, CA, April 23, 2013

“Distinguished Faculty Award,” John Jay College Alumni Association, New York, 2013.

Markowitz, Gerald and David Rosner. “Occupational Diseases.” The Cambridge World History of Human Disease. Ed. Kenneth F. Kiple. Cambridge University Press, 1993. Cambridge Histories Online. Cambridge University Press. 20 June 2008

“Katrina started at Ground Zero,” in Tom Engelhardt, The World According to TomDispatch: America in the New Age of Empire, (London, New York, Verso, 2008) (with David Rosner) Educating for Justice, A History of John Jay College, (New York: John Jay Press, 2004, 3rd edition, 2008)

“Labour and Community in Cancer Alley, U.S.A.,” The IAVGO Reporting Service (Industrial Accident Victims’ Group of Ontario), 16 (Winter 2002/2003), 19-27. (With D. Rosner)

Entry in “What’s the Best Business Book You’ve Read this Year?” Across the Board: The Conference Board Magazine of Ideas and Opinion, 39 (Nov/Dec 2002), 70.

“The History of the Lead Industry’s Promotion of White Lead Paints,” Lead Paint Poisoning Prevention and Litigation, (New York State Bar Association Continuing Legal Education, 2002), K1- K56. (With D. Rosner)

“Lead: The Relevance of History,” Mealey’s Litigation Report: Lead, 11, 3 (November 1, 2001), 1-19. (with D. Rosner)

Arthur Vilsel tear Award for “Outstanding Contributions to the History of Public Health,” Medical Care Section, American Public Health Association, 2000.

“Re: An Early Study of Pulmonary Asbestosis Among Manufacturing Workers: Original Data

and Reconstruction of the 1932 Cohort,” American Journal of Industrial Medicine, 34 (October 1998), 405-406.

“Occupational Disease,” Pittsburgh Post-Gazette, November 22, 1988, p. 15 in Special Section, “Health and Human Values.”

Educating for Justice, A Brief History of John Jay College, (New York: John Jay Press, 1990).

“Workers and the ‘Right to Know,’” Our Right to Know, Fund for Open Information and Accountability, Spring 1985, pp. 15-16.

"The 'Crime of the Century' Revisited: David Greenglass' Scientific Evidence in the Rosenberg Case," Science and Society, 46 (Spring, 1980), 1-26.

Introduction to David Starr Jordan, Imperial Democracy (New York: Garland Publishing Inc., 1972).

Introduction to John Bakeless, Economic Causes of Modern War (New York: Garland Publishing Inc., 1972).

Introduction to James Shotwell, On the Rim of the Abyss (New York: Garland Publishing, Inc., 1972).

Selected Book Reviews:

Julie A. Cohn, The Grid: Biography of an American Technology, Journal of American History, 105 (March 2019), 1043.

Lisa Martino-Taylor, Behind the Fog: How the U.S. Cold War Radiological Weapons Program Exposed Innocent Americans, Missouri Historical Review, 112 (July 2018), 308-310.

Karen L. Walloch. The Antivaccine Heresy: Jacobson v. Massachusetts and the Troubled History of Compulsory Vaccination, American Historical Review, 123 (February 2018), 244-245.

Paul David Blanc. Fake Silk: The Lethal History of Viscose Rayon, American Journal of Industrial Medicine, 60 (2017), 408–409.

Cody Ferguson. This Is Our Land: Grassroots Environmentalism in the Late Twentieth Century, in American Historical Review, 121 (2016), 1706-1707.

Lundy Braun, Breathing Race into the Machine: The Surprising Career of the Spirometer from

Plantation to Genetics, in Dynamis, 36 (2016), 252-255.

David G. Schuster, Neurasthenic Nation: America's Search for Health, Happiness, and Comfort, 1869-1920, in The Historian, 74 (Winter 2013), 854-55.

David Zierler, The Invention of Ecocide: Agent Orange, Vietnam, and the Scientists Who Changed the Way We Think about the Environment, in Environmental History, 17 (April 2012), 431-433.

Donald W. Rogers, Making Capitalism Safe: Work, Safety and Health Regulation in America, 1880-1940, in Left History, 15 (2) (Fall/Winter 2011), 151 - 153.

James D. Schmidt, Industrial Violence and the Legal Origins of Child Labor, in Medical History, October, 2011, 563 - 565.

Nancy Langston, Toxic Bodies: Hormone Disruptors and the Legacy of DES, in Environmental History, 16, 2 (2011)

William R. Freudenburg, Robert Gramling, Shirley Laska, and Kai T. Erikson, Catastrophe in the Making: The Engineering of Katrina and the Disasters of Tomorrow in Environmental History, 15, 2 (2010), 330-331.

Thomas O. McGarity and Wendy E. Wagner, Bending Science: How Special Interests Corrupt Public Health Research, in ISIS, 100:2 (2009), 440-441.

Arthur McIvor and Ronald Johnston, Miners' Lung: A History of Dust Disease in British Coal Mining, in Enterprise and Society, 9:3 (September 2008), 543-545.

Werner Troesken, The Great Lead Water Pipe Disaster, in ISIS, 98:4 (2007), 859-860.
Robert D. Bullard (ed), The Quest for Environmental Justice: Human Rights and the Politics of Pollution, in Human Ecology, 35 (April 2007), 257-258.

Priscilla Coit Murphy, What a Book Can Do: The Publication and Reception of *Silent Spring*, in American Historical Review, 111, 5 (December 2006), 1563-1564.

Pete Daniel, Toxic Drift: Pesticides and Health in the Post World War II South, in The Journal of American History, 93, 4 (September 2006), 602-3.

William G. Rothstein, Public Health and the Risk Factor: A History of an Uneven Medical Revolution, in Isis, volume 96 (June 2005), 305.

Howard Markel, When Germs Travel: Six Major Epidemics that Have Invaded America Since

1900 and the Fears They Have Released, in Health Affairs, 23 (November/December 2004), 267-268.

Peter English, Old Paint: A Medical History of Childhood Lead Poisoning in the United States to 1980, in Isis, volume 94, Number 4.

Martha Stephens, The Treatment: The Story of Those Who Died in the Cincinnati Radiation Tests, in The Journal of American History, June 2003, 300-301.

Joseph T. Hallinan, Going Up the River: Travels in a Prison Nation, in Journal of Public Health Policy, 23, 1 (2002), 136-138.

Michael R. Grey, New Deal Medicine: The Rural Health Programs of the Farm Security Administration, in American Historical Review, 106, 1 (February 2001), 196-197.

Christian Warren, Brush with Death: A Social History of Lead Poisoning, in Health Affairs, 19, 6 (November/December 2000), 300-301.

Dorothy Porter, Health, Civilization and the State: A History of Public Health from Ancient to Modern Times, in Journal of Public Health Policy, 21,4 (2000),496-499.

Alan Derickson, Black Lung: Anatomy of a Public Health Disaster, in Labor History, 40, 4(1999), 550-551.

Franklin Zimring and Gordon Hawkins, Crime is Not the Problem in Journal of Public Health Policy, 20 (1999), 128-131.

Claudia Clark, Radium Girls: Women and Industrial Health Reform, 1910-1935 in Journal of American History 85 (June 1998), 291-292.

Linda Lear, Rachel Carson: Witness for Nature in Environmental History, 3 (April 1998), 235-236.

Michael B. Katz, Improving Poor People: The Welfare State, the 'Underclass,' and Urban Schools as History, 37 (Summer 1997), 229-231.

Robert E. Botsch, Organizing the Breathless: Cotton Dust, Southern Politics and the Brown Lung Association in Journal of American History, 81 (December 1994), 1387.

James C. Robinson, Toil and Toxics: Workplace Struggles and Political Strategies for Occupational Health, in Journal of Health Politics, Policy and Law, 18 (Winter 1993), 993-996.

Larry Lankton, Cradle to Grave: Life, Work, and Death at the lake Superior Copper Mines in Journal of American History, 80 (June 1993), 290-291.

Selected Presentations:

Feb. 7, 2018 Panel Presentation on Corporations and Health, Scientific Integrity Roundtable, convened by Senator Sheldon Whitehouse, United States Capitol, Washington D.C.

May 10, 2017, Poisoning Flint: An (Ongoing) American Story of Race, Class and Industrial Pollution,” Weill Cornell College of Medicine, David Rogers Health Policy Colloquium, New York, NY.

April 22, 2017, “Childhood Lead Poisoning,” Global Health and Innovation Conference, Yale University, New Haven, CT

March 30, 2017, “Dust and Disease,” 6th International Conference on the History of Occupational and Environmental Health, International Commission on Occupational Health, Gothenburg, Sweden.

March 29, 2017, “Poisonous Paths: Using Internal Corporate Documents to Assess Industry’s Impact on Workers and Community Health,” 6th International Conference on the History of Occupational and Environmental Health, International Commission on Occupational Health, Gothenburg, Sweden.

December 9, 2016, “Social Scientists in the Courtroom: The Power and Limitations of History to Effect Social Change,” Université Paris-Dauphine - Research University, Paris France

December 7, 2016, Keynote, “Citizen Scientists: The Role of the Courts and the Public in Redefining Science and Public Health,” International symposium, “What Sort of Science(s) Could Make a Better Contribution to Decision-Making in Occupational Health,”Ecole Des Hautes Etudes en Sante Publique, Paris, France.

November 9, 2016, “Lead Poisoning: An (On-Going) American Tragedy of Race, Class and Industrial Pollution,” Tulane University Environmental Studies (EVST) Focus on the Environment Speaker Series, New Orleans, Louisiana.

November 4, 2016, “The Long View on Lead: Covering the Crisis from Flint and Beyond,” Association of Health Care Journalists, Webinar, AHCJ Core Topics: Social Determinants and Health Disparities.

October 25, 2016, “Lead: Peeling Back the Layers,” The Foundation (of Oneida and Hekemier Counties, NY), Utica, NY.

October 17, 2016, “Post Office and Public Art in the New Deal,” Columbia University Seminar on Full Employment, Social Welfare, and Equity, New York, NY

September 9, 2016, “New Deal Murals: Democracy in Action,” Vassar College, Poughkeepsie, NY

September 8, 2016, “Lead Poisoning: America’s Longest and Most Preventable Epidemic,” Honor’s College, Queens College, Queens, NY

February 3, 2016, “Poisoning Flint: An (On-Going) American Study of Race, Class and Industrial Pollution,” Mailman School of Public Health, Columbia University.

November 9, 2015, “Lead Poisoning in Historical Perspective,” New York University, Galletin School.

June 24, 2015, “How Occupational Health History Informs the Future,” Keynote, Future of Occupational Health Symposium, Burke Museum of Natural History and Culture, University of Washington, Seattle.

May 21, 2015, “Occupational Health and Environmental Health: A Troubled History” Keynote Address for In and Out of the Workplace: The Framing of Health Issues, An International Conference Organized by Cermes3, Paris, France

May 15, 2015, “Lead Wars: The Politics of Science and the Fate of Children,” Keynote, Living in a Toxic World (1750-2000): Experts, Activism, Industry and Regulation, Mao, Menorca, Spain, European Society for the History of Science.

April 22, 2015, “Commemorating the Five Year Anniversary of the EPA Lead Paint Rule,” Metro NY AIHA meeting. New York, New York.

April 22, 2015, “American’s Longest Epidemic: Childhood Lead Poisoning and the Crisis of Industrial Pollution,” Earth Day Celebration, Hostos Community College, Bronx, NY

November 21, 2014, “Lead Poisoning in Historical Perspective,” Keynote address, “Getting to Zero Conference,” Childhood Lead Action Project, Providence RI.

September 18, 2014, “Vinyl Chloride,” Bicameral Task Force on Climate Change, History, Examining the Industrial History of Denial, Russell Senate Office Building, Washington, D.C.

September 12, 2014, “People in Motion: The Migration Project,” The Renaissance Guild, San Antonio, TX.

November 5, 2013, “Judging History: Lead Wars, the Politics of Science and the Fate of America’s Children” American Public Health Association Annual Meeting, Boston, MA.

October 8, 2013, “Lead Wars: The Politics of Science and the Fate of America’s Children,” The

Herbert H. Lehman Center for American History, Columbia University, New York, NY

October 4, 2013, “Miller Center Forum on Gerald Markowitz and David Rosner’s Lead Wars: The Politics of Science and the Fate of America’s Children,” Morning session devoted to Rosner and my presentation on our book; afternoon session respondents to a panel discussion devoted to our book. 2013 Fall Fellows Conference, Sponsored by The Miller Center, University of Virginia, Charlottesville, VA.

September 12, 2013, “Cover the Earth: Lead Wars and the Politics of Science,” Rutgers Institute for Health, Health Policy and Aging Research,” New Brunswick, NJ.

April 16, 2013, “The Lilianna Sauter Lecture: Lead Wars: The Politics of Science and the Fate of America's Children,” New York Academy of Medicine, New York, NY

April 1, 2013, “Café Columbia with Professors of Public Health David K. Rosner and Jerry Markowitz,” Columbia University Alumni Association, New York, NY

December 8, 2012, “Lead Wars: The Politics of Science and the Crisis for Public Health,” Annual Meeting of Environmental Health Scholars, Reston, VA.

April 29, 2012, “With the Best of Intentions,” American Association for the History of Medicine, 85th Annual Meeting, Baltimore, MD.

November 30, 2011, “Lead Abatement Studies at the Kennedy Krieger institute,” Rensselaer Polytechnic Institute, Troy, New York

March 31, 2011, “The Revolution in Workplace Safety and Health: The Triangle Fire and its Aftermath,” University of Washington, Seattle, Washington

March 24, 2011, “The Triangle Fire and OSHA at 40,” The Murphy Institute, City University Graduate Center, “Out of the Smoke and the Flame: The Triangle Shirtwaist Fire and its Legacy,” New York

June 21, 2010, Plenary address, “Movements for Occupational and Environmental Health: History and Politics,” 4th International Conference on the History of Occupational and Environmental Health, San Francisco, CA

March 25, 2010, “A Short History of Lead Poisoning,” Johns Hopkins University School of Public Health, Baltimore, MD

December 3, 2009, “What Was New About the Depression and the New Deal,” American Social History Project, New York, NY

November 4, 2009, “A History of Silicosis,” Transnational History of an “Exemplary” Disease: Silicosis in the XXth Century, Rome, Italy.

March 18, 2009, “History and Perspectives on Lead,” Society of Toxicologists Annual Meeting, Baltimore, MD

March 13, 2009, “Manufacturing Doubt,” Science Communication Fellows Annual Meeting, Washington, DC

December 11, 2008 “Why Has Silicosis Become the Major XXth Century Occupational Disease? Economic , Technical and Political Background,” Transnational History of an “Exemplary” Disease: Silicosis in the XXth Century, Wissenschaftszentrum Berlin Fur Socialforschung, Berlin, Germany

October 1, 2008, Panel discussion, “Politics in Science: Who Decides What Gets Done and What it Means?” Reuben H. Fleet Science Center, San Diego, CA.

October 2, 2008, “History and Science on Trial,” University of California, San Diego, Science Studies Program, La Jolla, CA.

September 16, 2008, “When History, Law and Public Health Collide: The Case of the Rhode Island Lead Paint Lawsuit” School of Public Health, Graduate Center, CUNY, Faculty Seminar Series.

April 4, 2008, “The Corporate Impact on Public Health: the Trials of Two Historians,” Sociology Department, CUNY Graduate Center: “Poisoned Environments: The Industrial History and Community Ethnography of Corporate Pollution,” New York, NY

November 19, 2007, “Impact of Litigation on Research,” Fourteenth Meeting of the Committee on Science, Technology, and Law, The National Academies, Wash. DC

November 16, 2007, “A ‘Gift of God?’ The Promise and Peril of New Technologies in the 20th Century,” 2007 Nanotechnology Occupational Health and Safety Conference, Center for Nanotechnology in Society, Santa Barbara, CA

November 15, 2007, “Trade Secrets: The Sequel,” University of California, Santa Barbara, Environmental Studies class, Santa Barbara, CA

November 4, 2007, “Role of the Lead Industry in a Public Health Tragedy,” American Public Health Association, Annual Meeting, Washington, DC

October 26, 27, 2007, Interntional Conference on Comparative Approaches to the History of Silicosis, Ecole des Hautes Etudes en Sciences Sociales, Paris, France

March 22, 2007, "An Historian in the Courtroom: The Chemical Industry, History and the Search for Truth," The Annual History Graduate Student Organization Lecture, University at Albany, State University of New York, Albany, New York

March 1 and 2, 2007, Plenary Presentations on the History of Occupational Health to State of New York/Public Employees Federation Statewide Health and Safety Conference, Albany, New York

December 13, 2006, "Lessons Learned About Preparedness," Emergency Health Preparedness Meeting, Reforming States Group and the Milbank Memorial Fund, New York, NY

December 7, 2006, "The Chemical Industry's Secret History: Plastics and Health in the 1970s and Today," UCLA Center for Occupational and Environmental Health Seminar Series, UCLA, Los Angeles, CA

November 29, 2006, "Are We Ready? Public Health Since 9/11," New Jersey Work Environment Council, Trenton, New Jersey

May 25, 2006, "The Challenge of 9/11 to the Ideologies of Population and Public Health," Ecole Libre des Hautes Etudes (ELDHE) and International Health Policy Research (IHPR), Third Study Group Meeting on Industrial Diseases, Yale University, New Haven, CT

April 11, 2006, "Silicosis and the Law in 20th Century America: Reflections on US Legal History," Working with Dust: Health, Dust and Diseases in the History Occupational Health: an International Comparative Conference on Industrial Health and Politics of Disease Regulation since 1700, Centre for Medical History, University of Exeter, Exeter, England

February 24, 2006, "Chemical Contamination, Deceit, Denial, and the Politics of Industrial Pollution," Metro New York American Industrial Hygiene Association and Metro New York, American Society of Safety Engineers, Joint Breakfast Meeting, Pfizer, New York, New York.

May 23, 2005, "Chemical Controversies: Deceit and Denial and the Politics of Industrial Pollution," Fifth Annual Upton Sinclair Memorial Lecture for Outstanding Occupational Health, Safety, and Environmental Investigative Journalism, Social Concerns Committee, American Industrial Hygiene Association, May, 2005.

March 8, 2005, "Trials and Tribulations: Chemicals, History and the Integrity of Social Science," Columbia University, Mailman School of Public Health, Department of Sociomedical Sciences, Seminar Series.

February 17, 2005, Clason Lecture, Western New England College School of Law.

October 20, 2004, "Cancer Alley: Environmental Justice, Labor and Community Activism," Drexel Univ. Conf. on Environmental Justice: Politics, History and Health.

May 13, 2004 "Implications of Brown v. Board of Education: Then and Now," CUNY Graduate Center Symposium on Brown, 50 Years Later.

April 20, 2004, "Natural and Un-natural History of Disease: 9/11 and the Public Trust," Columbia University, Mailman School of Public Health, Forum on Public Health in International Contexts, Globalization and the Fabric of Public Health in Historical Context.

February 17, 2004, "Counting out an industrial epidemic: silicosis, social epidemiology, and the mysterious disappearance of an industrial disease," Ecole Libre des Hautes Etudes (ELDHE) and International Health Policy Research (IHPR), Second Seminar in Social Epidemiology: Industrial epidemics, New York University.

November 13, 2003, "Book Panel on Gerald Markowitz and David Rosner, Deceit and Denial: The Deadly Politics of Industrial Pollution, Social Science History Association, Baltimore, Maryland.

October 10, 2003, "The Un-Natural History of Public Health: From Epidemics and Injuries to Chronic Illness and Bioterrorism," Robert Wood Johnson Foundation Investigator Awards in Health Policy Research, Tenth Annual Meeting, Wash. D.C.

July 11, 2003, "Deceit and Denial in the Lead Industry," Center for Science in the Public Influence, Conference on "Conflicted Science: Corporate Influence on Scientific Research and Science-Based Policy," Washington D.C.

June 2, 2003, Lecture, "Deceit and Denial: the Deadly Politics of Industrial Pollution," City University of New York's Urban Health Initiative End of Year Lecture and Celebration, New York, NY

May 16, 2003, Plenary Lecture, "Deceit and Denial: the Deadly Politics of Industrial Pollution," Indoor Environmental Health and Technologies Conference, New Orleans, LA.

March 28, 2003, "Creating an Environmental Disaster through Advertising: The Childhood Lead Paint Tragedy in the United States," American Society for Environmental History, Providence, RI.

March 26 and 27, 2003, Keynote Presentations, Occupational Disease Symposium, Ontario Federation of Labor, Toronto, Canada.

February 26, 2003, New York Academy of Medicine, New York, NY

Nov. 8, 2002 "Book Talk," Environmental Health Coalition, Mission Valley Public Library, San Diego, California

Nov. 7, 2003, “Book Reading and Discussion,” Midnight Special Bookstore, Santa Monica, California

Nov. 6, 2002, “Author Series,” Harold Washington Library Center, Chicago Public Library, Chicago, IL

Nov. 4, 2002, “Covering the World with Lead: The History of a Public Health Tragedy,” Seminar in the History of Medicine, National Library of Medicine, History of Medicine Division, Bethesda, Maryland.

Oct. 30, 2002, “Lecture and Discussion of Deceit and Denial,” Seminar on Heath and Society, Brown University, Providence, Rhode Island.

Oct. 30, 2002, “Covering the World with Lead: A Brief History of a Public Health Tragedy,” Center for Environmental Studies, Brown University, Providence, RI.

Oct. 12, 2002, “Lead Poisoning in Baltimore,” Society of Environmental Journalists, Baltimore, Maryland.

Oct. 9, 2002, “Deceit and Denial: The Deadly Politics of Industrial Pollution,” a History of Science, Medicine and Technology lecture Johns Hopkins University Medical School, Baltimore, Maryland.

May 3, 2002, “Manufacturing Disease: Corporate Responsibility in a Public Health Disaster,” Ethics, Invention, and Sustainability: Environmental Health and Corporate Environmentalism, A Symposium at Johns Hopkins University, Baltimore, Maryland.

April 12, 2002, “The Role of the Public Intellectual,” panel discussion, Organization of American Historians, Washington, D.C.

March 25, 2002, “A Brief History of Lead,” Centers for Disease Control and Prevention (CDC), National Center for Environmental Health, Atlanta, Georgia.

September 2, 2001, “The Right to Know: the Plastic Industry, Government, and Occupational Health Research,” Occupational Health and Public Health: Lessons from the Past -- Challenges for the Future, 2nd International Conference on the History of Occupational and Environmental Prevention, Norrkoping, Sweden.

March 2, 2001, “The Vinyl Chloride Story: A Case Study,” Institute for Social, Economic, and Ecological Sustainability, Safety First Conference, University of Minnesota, St. Paul, Minnesota.

September 29, 2000, “Covering the World with Lead: The Industry and Childhood Lead Poisoning,” New York State Department of Health and Montefiore Medical Center Lead Poisoning Prevention Program, Childhood Lead Poisoning Prevention Conference, Purchase College, SUNY, New York.

May 19, 2000, “‘Cater to the Children’: Marketing Lead Paint to Kids in the Years Between the Wars,” American Association for the History of Medicine, Bethesda, Maryland.

April 6, 2000, “History of the Lead Paint Industry,” Look Out for Lead 2000: a Conference of the Wisconsin Department of Health and Family Services, Madison, Wisconsin.

March 18, 2000, “Environmental Justice in Convent Louisiana,” Environmental History Society, Annual Meeting, Tacoma, Washington.

November 18, 1998, “The Court of Public Opinion: Silicosis and the Role of History,” American Public Health Association, Annual Meeting, Washington, D.C.

May 21, 1998, “Dying for Work: The Birth, Death and Rebirth of Silicosis as a National Issue,” at Empire State College, The Harry Van Arsdale Jr. School of Labor Studies, New York, NY.

March 26-27, 1997 Panelist, “What’s Preventing Prevention?” National Silicosis Conference, Washington, D.C.

March 11, 1995, “The Changing Face of Environmental Justice,” American Society of Environmental History, Las Vegas, Nev.

February 9, 1995, “Race and the Politics of Abandonment, New York City in the Post-War Decades,” at The Orphan Project, Fund for the City of New York.

November 3, 1994, “Psychiatry and Race in New York,” American Public Health Association, Annual Meeting, Washington, D.C.

November 30, 1993, Thresholds and Silica - The Problem of Medical Uncertainty,” Second International Conference on Silicosis and Cancer, San Francisco, Ca.

November 28, 1993, “The Ambiguous History of the United States Public Health Service,” American Public Health Association, Annual Meeting, San Francisco, CA.

October 13-14, 1993, “The Limits of Thresholds: Silica and the Politics of Science,” at Danger, Risk, and Safety: Ideas and Practices, Center for the History of Business, Technology, and Society, Hagley Museum and Library, Wilmington, DE

October 10, 1991 “Silicosis and the Politics of Industrial Disease,” The History of

Occupational Safety and Health, Third Labor History Symposium of the George Meany Memorial Archives, Washington, D.C.

May 4, 1990, "The Politics of Occupational Disease Political Science," Friday Forum CUNY Graduate Center.

October 23-25, 1986, "Safety and Health During the New Deal," North American Conference on Labor History, Toronto.

Nov. 13, 1984, "A Gift of God', The Tetra Ethyl Lead Controversy in the 1920s," American Public Health Association Annual Meeting.

Other Professional Activities and Public Service:

Manuscript Reviewer:

Journal Articles

American Historical Review

American Journal of Industrial Medicine

American Journal of Public Health

Bulletin of the History of Medicine

Business History Review

Enterprise and Society

ISIS

International Review of Social History

Journal of American History

Journal of Australian Studies

Journal of Health Politics, Policy and Law

Journal of Public Health Policy

Journal of Social History

Medical History

Milbank Memorial Quarterly

Public Health Reports

Social History of Medicine

Book Manuscripts

Indiana University Press

Princeton University Press

Cornell University Press

Temple University Press

Rutgers University Press

MIT Press

University of California Press

University of Chicago Press

University of Rochester Press

University of Minnesota Press
University of North Carolina Press
University of Pittsburgh Press
Yale University Press

Grant Reviewer:

National Endowment for the Humanities
Interpretive Research Division
Archive and Museum; Documentary
National Science Foundation
Division of Social and Economic Sciences
Division of Science and Technology Studies
New York Academy of Medicine

EXHIBIT E

List of Prior Testimony

**To the best of my recollection during the previous five years I have testified or been
deposed as expert:**

David Rosner

Testimony in Trial since 2011

York v. Meenan, June 13, 2019, Philadelphia, PA.

Dengler v. ?? May 30; June 4th, 2019, New York City

Burton v. Sherwin Williams et. al., May 15, 16, 2019, Milwaukee, WI.

Rimondi v. Johnson & Johnson, March 11, 2019, New Brunswick, NJ.

Hower v. Burnham, October 25, 2018, New York City.

September 19, 2018, Philadelphia, PA.

Sheilds v. , September 18, 2018, Rochester, NY.

Drew v. Honeywell, September 13, 2018, Baltimore, MD.

Foster v. Jenkins, August 29, 2018, Buffalo, NY.

Mendick v. Rohm & Haas, July 19, 2018, Philadelphia.

Ingram v. Johnson and Johnson, St. Louis, June 11, 2018.

MacDonald v. Dow Chemical, Plaquemine, LA. May 31, 2018.

Friedman v. ?, Sherman Oaks, California, May 14, 2018.

Saffo v. BNSF, Kansas City, Ka. January 29, 2018.

Ament v. John Crane, Baltimore, MD. October 30, 2017.

Montiel? v. LILCO, Riverhead, N.Y. October 12, 2017.

Concetta Schatz v. John Crane et. Al., Baltimore, August 2, 2017.

Nemeth v. ?, March 13,17, 2017, NYC.

Battistoni v. Aerco International, January 25, 2017, NYC

Stauch v. ? , New Brunswick, NJ, February 2, 5, 13, 2017

Coates v. Ford?, December 1, 2016 Baltimore.

Chris Coates v. ? November 16, 2016, Baltimore.

Britt v. Northrup, Miami, September 21, 2016.

Entwisle trial in Baltimore. July 11, 2016 (PGA).

Charles Zammit v. ? , July 8, 2016, NYC (Wilentz)

Toney (?) v. Burnham, June 8, 2016, New York City.

Adams v. John Crane, Savannah, June 2, 2016.

Marvin Smith v. AC&S, Baltimore, Md., April 26, 2016.

Brownlee v. Monsanto, April 21-22, 2016, Los Angeles, Superior Court, Case No. BC 497582

Bartolone v. Union Carbide et. al. New York City, March 16, 2016.

Parker v. Crane, Newport News, Virginia. February 29, 2016.

Ratlief v. Crane, February 19, 2016 Baltimore.

Robusto v. Chrystal, October 26; November 19, 2015, New York City.

Trial -- Mt. Vernon, Ill., October 20, 2015.

Dublin v. Monsanto, Missouri Circuit Court, St. Louis September 21, 2015, St Louis.

Alternative Conflict Resolution, St. Louis, June 12, 2015.

James Poage v. Crane Co, St. Louis, June 25, 2015.

Schwartz v. (Through Ferraro,), Cleveland, Ohio, June 4, 2015.

Dominick v. Caterpillar, Utica, New York, March 12, 2015.

Chisholm v. Vanderbilt Minerals, LLC, Schenectady, NY. February 2, 2015.

Watkins v. New York City, January 16, 2015. (Madden Courtroom, NYS), New York City, January 6, 2015

Nash v. Navistar, Syracuse, NY, December 10, 11, 2015.

Watkins v. Bendix Co., Cleveland, Ohio, December 4, 7, 2014.

Alfredo Fernandez v. Florida Power & Light Company and Foster Wheeler Energy Corporation, Miami, Florida, November 10, 2014.

Blommer v. BNSF, Ft. Worth, Texas, October 7, 2014.

Ralph North v. National Grid Generation LLC, et al. New York, N.Y. September 15, 2014.

Freeman v. Crane Company, New York Trial Group, New York City, June 9, 2014.

Bryant v. Crane et. al., New York Supreme Court, Justice Kern, May 14, 15, 2014.

Jacqueline Smith, Virginia Pierce, And Mark Rametta, Plaintiffs, vs. Monsanto Co., Solutia, Inc., Pharmacia Corp., Pfizer, Inc., Southern California Gas Co., May 1,2, 2014, Los Angeles, California.

Goins v. John Crane, April 11, 2014. Atlanta, Georgia. [Levy Konigsberg, law firm].

Baltimore, Maryland, Peter G. Angelos Trial. March 26, 2014.

The State Of Ohio, Judge Harry A. Hanna, County Of Cuyahoga, In The Court Of Common Pleas, Civil Division, Frances A. Thatcher, on behalf of the Estate of Ronald H. Thatcher, Plaintiff,-v. 3M Company, et al., Defendants. Case No. 752608, October 1, 2013.

The People of the State of California, et al. vs. Atlantic Richfield Company, et al. Civil Action No. 1-00-CV-788657, San Jose, July 18, 22-24, 2013.

Adams v. A. W. Chesterton Co., et al. Savannah, Georgia, July, 12, 2013.

Santos Assenzio, Robert Brunck, Paul Levy, Cesar O. Serna And Raymond Vincent, Plaintiffs, A.O. Smith Water Products, et al, Defendants. Supreme Court Of The State Of New York, New York County : Civil Term : Part 11, June 4-8, 2013.

Norman Burke et. al., vs. ACandS, Inc., et.al., Consolidated Case No: 24X11000780, Baltimore, Circuit Court, April 29, 2013.

Benita Blonder v. Crane, Georgia Pacific, et. al., New York, January 8, 9, 16, 17, 2013.

Andrew Dean, Et Al., Plaintiffs V. AC and S, Inc., Et Al. Defendants, Consolidated No: 24-X-11-000027, October 9, 2012 The Circuit Court For Baltimore City In Re: Personal Injury Asbestos Litigation.

Preston Alexander, et al., Plaintiffs vs. Fluor Corporation, et al., Defendants. Cause No. 052-9567, July, 2011 Missouri Circuit Court for the Twenty-Second Judicial Circuit in the City of St. Louis.

Depositions (to the best of my recollection)

Vasquez v. Cyprus Amax Minerals, July 24, 2019, Albany, New York

Barrilleaux v. Crane Co, July 14, 2019, telephonic.

Bell v. Borg-Warner et. al., June 12, 2019, Telephonic.

Musacchio v. April 12, 2019

Kim Young v. Avon, April 3, 2019, New York City.

Gibbons v. Borg-Warner and Kawasaki, March 29, 2019 telephonic.

Tyler v. Borg-Warner and Petboy, March 8, 2019, telephonic.

Haver v. Feb. 5, 2019.

Serota v. Union Carbide. January 15, 2019, New York City

Sepanek v. ?, January 10, 2019, New York City

Rickards v. ?, January 9, 2019, New York City

Groves v. ?, December 19, 2018, New York City (one hour phone deposition)

Williams v. Ford, Dec. 10, 2018, Telephonic.

Edwards v. December 4, 2018, New York City.

Ruman.Rimondi v. Johnson & Johnson, Dec. 5, 2018, New York City.

Beardsley v. ?, September 17, 2018, [Telephonic].

Houghtby v. Honeywell, September 11, 2018, [telephonic].

Alexander v. Honeywell, September 10, 2018, New York City.

Umemoto v. ABB, Inc. September 4, 2018, New York City.

Pearson v. Crane Company and Union Carbide, September 5, 2018, New York City.

Davis v. ?, August 14, 2018, New York City.

Sullivan v. Daniel International, August 15, 2018, New York City.

Dunning v. A.W. Chesterto Co et. al, August 1, 2018, New York City (telephonic)

Pfund v. Georgia-Pacific et. Al., July 13, 2018, Albany, NY.

Telephonic Deposition, for Peter G. Angelos, June 28, 2018.

Garcia v. Colgate-Palmolive, May 24, 2018, New York City.

Kasakowski v. Borg Warner, May 7, 2018, New York City.

Miller v. Weyerhauser, April 24, 2018, New York City

Alexander v. Honeywell, April 17, 2018, New York City

Blake and Eibl v. ACandS, April 6, 2018, New York City

Ingham v. Johnson & Johnson, March 29, 2018, New York City.

Donahue v. John Crane, March 5, 2018, New York City (telephonic)

Templet v. Avondale, March 2, 2018, New York City (one hour)

Bostic-Boyd v. Johnson & Johnson , February 16, 2018, New York City.

McDonald v. Dow, Feb. 15, 2018, New York City

Donovan v. John Crane, February 12, 2018 New York City (telephonic)

Mullinex v. John Crane, February 9, 2018, New York City.

Hare v. Cumberland Cement, February 6, 2018, (Telephonic)

Kohr v. Colgate, February 1, 2018, New York City.

Blouin/Templet v. Avondale, January 30, 2018, New York City (telephonic)

Ratcliff v. Johnson & Johnson, January 12, 2018, New York City.

Carmen Ward v. ?, January 9, 2017, New York City.

Gibbons v. Johnson & Johnson, Telephonic Deposition, December 8, 2017.

Goodhue v. 3M, New York, NY, November 13, 2017.

McDonald v. Dow Chemical, New York, November 9, 2017.

Kesner v Pneumo Abex Corporation - Telephonic Deposition, November 6, 2017.

Abeytas v. A&A Building, October 2, 2017, New York City.

Russell (?) v. Colgate, September 27, 2017, New York City.

Harry L Goodrich and Agnes P. Goodrich v. John Crane Inc. New York September 20, 2017

Clayton Russell v. ?. September 15, 2017, (telephone), New York

Eugene O'Neill vs. Vanderbilt Minerals, LLC, (via telephone), September 6, 13, 2017. New York

Frederickson v. Whirlpool, June 12, 2017, New York City

Fredericks v. ?, May 31, 2017, New York City.

Milwaukee v. Sherwin Williams (?), May 18, 2017

Walter Ciokajlo v. ?, March 20, 2017, NYC.

Greenhill v. AC&S, Telephonic Deposition (continued), New York. March 8, 2017.

Watson v. Wallace, New York, February 8, 2017, (PGA)

Ralph Hare v. ACandS, Inc., et al. February 8, 2017, NYC.

Busch v. Union Carbide, Nov. 30, 2016, via telephone.

Gulliksen v. GP? November 18, 2016, via telephone.

Terry Spring v. Ahlstrom Pumps, November 1, 2016, New York City.

Rockman v. Union Carbide; Coates v. October 12, 2016, New York City, both via phone.

Meier v. ABB September 19, 2016, New York City.

Cumbest v. Wallace & Gale, September 1, 2016, (telephonic).

Baton Rouge Case for Heard Robins, August 24, 2016, NYC.

Snyder v. Crane, August 23, 2016, NYC.

Haefale v. Crane (?), August 16, 2016, August 16, 2016.

Standley v. Crane (?), July 26, 2016, Albany, NY.

Toney v. Crane Co., Docket No. 1:15-cv-07413-PGG (SONY), June 9, 2016, New York City.

Gondar and Lalama v. Burnham, May 25, 2016, New York City.

Coykendall v. Honeywell, May 24, 2016, New York City.

Bronless v. Monsanto, Brownlee v. Monsanto, New York, April 4, 2016

Smith v. ACandS et al., Baltimore City Case, March 24, 2016 (telephonic).

Ward v. A-Best Products et al. March 9, 2016, New York City.

Padgett v. John Crane, February 9, 2016, New York City.

Entwistle trial group (Baltimore) [by telephone] January 6, 2016.

Herndon v. A.O. Smith Corp. December 15, 18, 2015, New York City.

Parker v. Crane, December 7, 2015, New York City.

Malen? v. ?, November 10, Dec. 17, 18, 2015, [telephonic] New York City.

Malek v. Chevron et. Al., Nov. 5, 2015, New York City.

Tattlor v. Ace Hardware. Nov. 3, 2015, New York City [Telephonic] [continued Dec 17 by phone]

Taylor (Russell) v. Crane September 28, 2015, [telephone].

Sieber v. 4520 Corporation, Harris County, Texas, Cause # 2012-14503 – ASB, September 14, 2015, New York, NY.

Dublin (Carter) v. Monsanto, Missouri Circuit Court, St. Louis, (or Carter v. Monsanto, Los Angeles, Central Civil West), May 21, & August 4, 2015, New York City.

Chapman v John Crane, Case No. CL14-01383P-03(DP), Virginia, Newport News, July 20, 2015, Albany, NY.

Solimini v. Air & Liquid Systems. (Commonwealth of Massachusetts Middlesex Superior Court August 26, 2015 New York City.

Gilb v. Ford, July 29, 2015, New York City.

Heckaman, Poage v. Crane Co., June 1, 2015, New York City.

Esposito v. (through Heard Robins) May 28, 2015, New York City.

Joe Purdue v. A.W. Chesterton Co., Cuyahoga County, Ohio, May 7, 2015, New York City.

Gilb v. Ford Motor Company, Case # CV-14-822147, Cuyahoga County Court, Ohio, New York City, March 26, 27, 2015.

Ament v. ACand S, Baltimore City (Meso Trial Group), New York, NY via phone, March 17, 2015.

Osterhout v. Air & Liquid Systems Corporation, et al. January 14, 2015, New York

William McGovern Deposition, December 19th, 2014, New York City.

John New Deposition, Dec. 18, 2014, New York City.

Hammonds v Monsanto et al; and Hearin and Montgomery v Monsanto, Dec 15, March 31, 2015, New York City.

Glenn Watkins deposition, New York, October 16, 2014

Magaly Fernandez v. American Optical, Foster Wheeler and Zurn Industries, 11th Circuit, Miami-Dade County Florida, Case No. 11-17044 CA 42, New York City, October 9, 2014.

Myrna Korsh Deposition, New York, Oct. 3, 2014.

Mary Hall vs. American Honda Motor Co., Case No. 13-12051, Broward County 17th Circuit Court, New York, NY. September 29th, 2014.

Elmer Hudson v. Dentsply International, Inc., September 11. 2014, New York City.

Blommer v. BNSF, Tarrant County, Texas, C.A. No. 17-264234-13, New York, NY September 9, 2014.

Kerekesh v. Waco, Inc., Civil Action No. CL12-01476V-04 (VC), June 12, 2014, New York City.

Peter Taub v. Basco et. al., New York, June 11, 2014.

Junius Millet v. Avondale Industries, et. al., Eastern District, Louisiana, C.A. 13-00934, June 4, 2014, New York City.

Gillis v. National Tile Council, in Baltimore, MD., May 29th, 2014, New York City.

? v. Pfizer, Baltimore County, May 28th, 2014, New York City.

Roy Shepherd v. Crain Company et. al., New York City, April 28, 2014.

Southern District of Florida, Ft. Lauderdale Division, Case No. 0:13-Cv-61510-Jic, James O'Neal And Linda O'Neal, Plaintiffs, v. Alfa Laval, Inc., Et Al., Defendants. New York City, April 21, 2014.

Virginia: In the Gloucester Circuit Court, Raymond Blanchette v. Waco Inc., et. al., April 1, 2014, New York.

Gillis & Mabry, March 28th, 2014, New York City (PGA)

Virginia: In The Circuit Court For Newport News, Betty M. Moran, Individually And Executor Of The Estate Of Edwin G. Moran Plaintiff, v. John Crane Inc., Defendants, March 5, 2014, New York.

Ivory Black, Plaintiff v. Union Carbide et al., Defendants, (in New Orleans), February 21, 2014, Wales Hotel, New York. Civil District Court, Orleans, Louisiana, No.: 2013-3681 Division L Section 6, Ivory Black v. Reilly-Benton, et. al., February 21, 2014, New York City.

Goins v. John Crane, et. al., February 4, 2014, New York City. [Levy Konigsberg].

Knight v. AGL Welding Supply Co., Inc., et al. (MID-L-81-13-AS)
Whelan v. A. O. Smith Corp., et al. (MID-L-7161-12 AS), New Jersey, Lanier Law Firm, December 17, 2013.

Cuyahoga County, Marian McClinsey v. Allied Corporation, et. al., Case No. CV-771056, October 29, 2013, New York.

Guerieri Mesothelioma Trial Group, Baltimore, MD Consolidated No: 24x11000786, Cases Affected: Paul L. Good, Jr. Case No.: 24x11000424, Anthony Preissler Case No.: 24X12000958, October 10, (continued November 9, 2013), New York.

Barbara Lee-Ayers v. Avondale Industries, 2013-2964, New Orleans Parish, Louisiana, Oct 9, 2013, New York.

Frances A. Thatcher, on behalf of the Estate of Ronald H. Thatcher, Plaintiff,-v. 3M Company, et al., Defendants. (Levy, Phillips, Konigsberg, Plaintiff's attorneys), New York, September 3, 2013.

Nicholas Guerieri, *et al.* November 2013 Mesothelioma TG Plaintiffs v. ACandS, INC., *et al.* Defendants Maryland, (Levy, Phillips, Konigsberg, Plaintiff's attorneys), Consolidated Case No. 24X11000786 Case Affected: Michael McCurdy Case No. Case No. 24x07000235, New York, October 10, 2013.

Nakata v. Toyota, August 8, 2012, New York, Hawaii. 12-1-0266-01.

Goldsmith et. al., v. AC and S, Inc., Baltimore, Consol. Case No.: 24X11000783, July 9, 2013, June 13, 2013, New York.

Liverman v. John Crane, Case No. CL10-00328J-02, Circuit Court of Newport News, Virginia, New York, June 11, 2013.

Casabug v. Crane, May 7, 2013, New York, NY.

Norman Burke, et al., Plaintiffs, Cons. No. 24X11000780 ACandS, INC., et al., Circuit Court of Baltimore, New York, April 11, 2013.

Ellen Thompson V. A.O. Smith Corporation, et al. Defendants. Civil Action No.: Civil Action No.: 03-C-9600 and KAN 12-C-922 KAN, New York, January 18, 2013.

Jacqueline Smith et. al. v. Monsanto, et. al., Vase Number: BC 459771, County of Los Angeles, Superior Court, California, New York, January 4, 2013.

Ruth Nishida, et. al., v. Monsanto and Solutia, Cause # 09SL-CC01964, Missouri Circuit court, Twenty-First Judicial Circuit, St. Louis County, Nov. 18, 2010, January 7, 2013.

Martin V. Exxon, (Unglesby Law Firm), Louisiana, New York, December 7, 2012.

Bettie Raniolo v. Ford, (Levy, Phillips & Konigsberg, Law Firm for Plaintiffs), New York, December 6, 2012.

The People of the State of California v. Atlantic Richfield, et. al, Superior Court of California, Santa Clara County, Case Number 1-0-CV- 788657, October 22-23, December 17, 2012.

Andrew Dean, et. al. vs. ACandS, Inc., et.al., Circuit Court, for Baltimore City, Consolidated No: 24X11000027, September 20, 2012.

Raymond Smith v. Railroads, v. Pine Canyon Land Company, San Francisco, Ca. September 18, 2012.

Browne v. Crane Company, Circuit Court, State of Hawaii, Civil No. 11-1-0535-03 (RAN), September 17, 2012. Priority One Court Reporting Services Inc.

Chelsea Wren et. al. v Fluor Corporation, Missouri Circuit Court, 22nd Judicial Circuit (City of St. Louis), August 28, 2012.

Bolton et. al. v. ACandS, Inc. 17th Judicial Circuit, Broward County, Florida, August 1, 2012.
Case No. 00-10831(27).

Robert Bush v. 3M, 3rd Judicial Circuit Court, Madison, Ill. July 19, 2012. Case No. 12-L-168.

Roger Barnhill et. al. v. 3M et al., Circuit Court, 3rd Judicial Circuit Court, Madison, Ill. June 28, 2012

Perry Wilson Adams v. A. W. Chesterton Company, et al. Civil Action File No. STCV-10-3924,
May 4, 2012

George J. Adams v. Oakfabco, Inc., f/k/a Kewanee Boiler Corporation, et al
Madison County, Illinois – Cause No. 11-L-1038, February 24, 2012

“In Re: New York State Asbestos Litigation,” Supreme Court: All Counties within the State of
New York, New York, NY, February 28, 2012 (Continued, May, 2012).
Davis v. Genuine Parts, New York City, August 14th, 2018.

Sullivan v. New York City, August 15th, 2018.

Alternative Conflict Resolution -- May 12-15, 21, 2015, St. Louis Missouri.

EXHIBIT F

Gerald Markowitz Trial and Deposition Testimony

Trial Testimony

William Phipps and Linda Phipps, Plaintiffs, v. Ajax Boiler & Heater Co., et al., Defendants, Superior Court of the State of California, County of Los Angeles, Case No. 18STCV02021, June 12, 2019.

Glenn Burton, Jr., Plaintiff vs. American Cyanamid Co., et al., United States District Court, Eastern District of Wisconsin, Milwaukee Division, Case No. 07-CV-000303, May 9, 10, 15, 2019.

Efrain Fay v. Burnham and Kohler, Supreme Court of the State of New York County of New York, In Re: New York City Asbestos Litigation, WL File #209438, April 23, 24, 2019.

Mary Lea Kennedy, Individually and as surviving Heir of the Estate of Robert Hare, Deceased, Plaintiff v. Advance Auto Parts, Inc., et al., Defendants, In the Circuit Court of the Twenty-Second Judicial Circuit, St. Louis, MO, Case No. 1622-CC10186, April 4, 2019.

Philip Cirrone, as Administrator for the Estate of Susan Cirrone and Philip Cirrone, Individually, Plaintiffs against Anchem Products, et al., Defendants, supreme court of the State of New York, county of New York, Index No.: 190338-13, December 18, 2018.

Jo Ann Startley, Individually and as Executor of the Estate of Ronnie A. Startley, Deceased, Plaintiff(s), vs. Welco Manufacturing Company, et al., Defendant, In the Circuit Court of Cook County, Illinois, Court No. 14 L 2716 in Re: Asbestos Litigation, Dec. 12, 2018

Barbara J. Barr, Plaintiff vs. vs. A-1 Clutch Co., et al., Defendants, Superior Court of the State of California, County of Alameda, No. RG17880698, October 23, 2018,

Susan H. Schaberg, Individually and as Special Administrator for the Estate of Harold Schaberg, Deceased vs. A. W. Chesterton Company, et al. In the Circuit Court, Third Judicial Circuit, Madison Co., IL Case No. 16-L-393, September 14, 2018.

Louis Summerlin et al., v. Philip Morris USA et al., Massachusetts Superior Court C.A. No. 15-5255, September 10, 2018.

Bradd v. Air & Liquid Systems Corporation. et al. Alameda Superior Court Case No. RG17884478, Aug. 2, 2018.

Walter Twidwell, Plaintiff vs. Aerco International, Inc., et al., Defendants, Supreme Court of the State of New York County of New York, In Re: New York City Asbestos Litigation, Index No.: 190136/2017, July 20, 23, 2018.

Knutson v. Air & Liquid Systems Corporation, et al., Alameda County Superior Court Case No.: RG17886959, July 3, 29, 2018

Robert S Trumbull, Plaintiff, against Adience, Inc, et al, Defendants, Supreme Court of the State of New York, County of New York, Index no. 190084-16, May 9, 10, 2018.

KAYE VIPOND, Individually and as Special Administrator of the Estate of JOHN VIPOND, deceased, Plaintiff, vs. CNH INDUSTRIAL AMERICA, LLC, *f/k/a* INTERNATIONAL HARVESTER, et al., Defendants, in the Circuit Court Twentieth Judicial Circuit St. Clair County, Illinois No. 16 -L-376., April 25, 2018.

Mata, et al. v. Air & Liquid Systems Corporation, et al., Los Angeles Superior Court, Case No. BC655564, April. 5, 6, 2018.

Mary Murphy-Clagett, as Temp. Admin. for the Estate of Pietro Maculoso, Plaintiffs against A.O. Smith Corp., et al., Defendants, Supreme Court of the State of New York, County of New York, Index no. 190311/2015, March 13, 15, 2018.

Colleen Schrader, Extrx. of the Estate of Ernest Schrader, Deceased v. Air & liquid systems Corp., et al., Philadelphia court of Common Please, September Term 2016, No. 1786, March 14, 2018.

Jerry Craft versus Ports America Gulfport, Inc., et al., Civil District Court for the Parish of Orleans, State of Louisiana, No. 2017-06069, Feb. 28, 2018.

Roger Carilli, Plaintiff -against- Burnham, LLC, Individually and as Successor to Burnham Corporation, Crown Boiler Co., F/k/a Crown Industries, Inc., the Fairbanks Company, and Jenkins Bros., Defendants. Supreme Court of the State of New York, New York County - Civil Branch - Part: 13 Index No. 190252/15, September 29, October 2, 3, 2017

Ronald Smith versus Georgia Pacific, LLC, et al., Civil District Court for the Parish of Orleans, State of Louisiana, No. 2016-8110, September 15, 2017.

All Simmons Hanly Conroy Cases in the In-extremis April 2017 Trial Cluster: Thomas McGlynn, Index No.: 190219/2016, Supreme Court of the State of New York County of New York, August 4, 2017.

Frank Hart and Cynthia Hart v. Calaveras Asbestos, Ltd., et al., Alameda Superior Court Case No. RG16838191, June 28, 29, 2017.

Lorraine R. Anisansel, Plaintiff v. Crane Co., et al Defendants, Supreme Court of the State of New York, County of New York, Index No. 190250/2013, June 9, 2017.

Arlin Anderson, Plaintiff, v. Air & Liquid Systems Corporation, et al., Defendants, Superior Court, County of Los Angeles, Case No. BC635249, April 21, 2107.

Joseph Maetke and Barbara Maetke, Plaintiffs, against ABB, INC. as successor in interest to ITE Circuit Breakers, Inc., et. al., Defendants, Supreme Court of the State of New York, County of New York, Index No.:190373-14., January 12, 13, 2017.

Julius David Bourke v. ExxonMobil Corporation, et al., Orleans Parish, Louisiana, Case No. 2015-8136, December 12, 2016

Peter J. LaMonica and Exine LaMonica, Plaintiffs, v. Colgate-Palmolive Company (Sued Individually and as Successor-in-interest to Mennen Company), et al, Defendants, Superior Court of the State of California, County of Los Angeles, Case No. BC604809, August 24, 2016.

Harris v. Milliken & Co., State Court of Athens-Clarke County, State of Georgia, Civil Action File No. ST14CV0025, July 22, 2016

In Re: New York City Asbestos Litigation, Index:190349/2013, Supreme Court, New York, NY, June 8, 10, 2016.

DeGioia v. Amchem Products, et al., Index No.: 61331/2014 Supreme Court of the State of New York County of Westchester, May 11, 12, 2016

Benito Walker, et al., Plaintiffs, v. Monsanto Company, et al., Defendant, Missouri Circuit Court, Twenty-Second Judicial Circuit, St. Louis City, Cause No. 1122-CC09621-01, May 5, 6, 2016.

Roslyn Dauber and John Di Costanzo, Plaintiffs, vs. Monsanto Company, et al., Defendants, Superior Court of the State of California, for the County of Los Angeles, Case No. BC483342, March 10, 11, 2016.

Gail A. Robinson, individually and as Personal Representative of the Estate of William J. Robinson, et al., Plaintiff, v. Flowserve, individually and as successor to Durco Pumps, and Goulds Pumps, Inc., Defendants, in the United States District Court for the District of Wyoming, Case No.: 2:14cv-00161 ABJ, November 20, 2015.

Doris Busbey, Extrx. of the Estate of John Busbey, Deceased and Widow in Her Own Right v. ESAB Corp., et al. Philadelphia Court of Common Pleas, May Term, 2012; No. 3046, October 26, 2015

Lisette Dorfman, as Administrator for the Estate of Linton Dorfman, and Lisette Dorfman, Individually, Plaintiffs, against Air & Liquid systems Corporation, et al., Defendants, Supreme Court of the State of New York, New York County, Civil Term, Part 11, Index No. 190214/2013, October 16, 20, 2015

Tommy D. Tate, Sr., and Aldoria Lagura Tate v. Amcord, Inc., et al., Los Angeles County Superior Court Case No. BC 560185, October 1, 2015.

Larry English, Administrator of the Estate of Sherry L. English, deceased, and Larry English in his own right, Plaintiff, vs. Borg-Warner Corporation, et al., In the Court of Common Pleas of Allegheny County, Pennsylvania, Civil Division – Asbestos, No. G.D. 13-022072, September 17, 2015.

Anthony J. Ricci, as Executor for the Estate of Peter L. Ricci, and Maria Ricci, Individually Plaintiff(s), -against- Aluminum Company of America (Alcoa), et. al., Defendant(s), Supreme Court of the State of New York, County of New York, Index No.:190424-13, July 31, 2015.

Dorothy Forgensi, Individually and as Executrix of the Estate of Rudolph Forgensi, deceased v. 84 Lumber Company, et al., Supreme Court of the State of New York, Monroe County, Index No.: 2014-4127, June 15, 2015.

Judith Ann Farrell Hicks, Individually and as Independent Executor of the Estate of Robert Samuel Hicks, Jr., deceased, v. Owens Illinois, Inc., et al., PCCP, September Term 2012, No. 2167, December 23, 2014.

Feuerman v. A. O. Smith Water Products Co., et al. Supreme Court of the State of NY, NY County. Index # 108170-06. Dec. 16-17, 2014

John Colasanti v. Air & Liquid Systems Corp., et al. Index# 2012-EF-64, County Court House, Syracuse, NY, November 24, 2014

Silvia Eliana Drufuka, Plaintiff v. Argo Corp., et. al, Defendants, In re: Fourth Judicial District Asbestos litigation, Supreme Court of the State of New York, County of Schenectady, Index No. 2010-2558. November 18, 2014.

Charles F. Hillyer v. A.O. Smith, et al., Supreme Court of the State of NY, New York County, Index No. 190132-13, November 13-14, 2014

Robert W. Jones, Sr., and Sharon E. Jones v. Calaveras Asbestos, Ltd., et al., Los Angeles Superior Court Case No. BC541164, November 12, 2014.

Charles Lutz and Janet Lutz vs. Cooper Industries LLC, individually and as successor in interest to Crouse-Hinds P.C.C.P., September Term, 2011, No. 2910 Weitz November 2013 Mesothelioma Trial Group No. 2396, November 14, 2013.

The People of the State of California v. Atlantic Richfield, et. al, Superior Court of the State of California, Santa Clara County, Case Number 1-0-CV-788657, August 5, 6, 7, 2013

Estate of Loren Liptak vs. Owens Illinois, Inc., et al. P.C.C.P., November Term, 2011, No. 2145, Philadelphia, PA, July 16, 2013.

Phyllis K. Saunders, et al. vs. 3M, et al; In the Circuit Court of the state of Missouri; 22nd Judicial Circuit (City of St. Louis), February 6, 2013.

Raymond Smith and Rosie Smith, Plaintiffs, vs. BNSF Railway Company, et al., Defendants. In the Superior Court of the State of California, in and for the County of Alameda, No. RG12623812, January 9, 2013

Chester Roney, Invid. & Exec. Est. of Henry Clay Roney, Jr. v. Gencorp, et al., United States District Court for the Southern District of West Virginia Case No. 03:05-0788, September 30, 2009.

Depositions (to the best of my recollection)

Kathleen A. Uzee, et al, versus Huntington Ingalls, Inc., et al., Civil District Court for the Parish of Orleans, State of Louisiana, Case No. 18-2770, July 15, 2019

Ronald Smith and Barbara Smith v. Amcord, Inc., Los Angeles County Superior Court Case Nos: JCCP4674/18STCV06783, July 15, 2019.

Tema Smith, et al. v. BorgWarner Morse Tec, Inc., et al., Alameda Superior Court Case No. RG17863935; George McLauchlan, et al. v. American Biltrite Inc., et al., Alameda Superior Court Case No. RG19002154, July 10, 2019.

San Diego Unified Port District, et al., Plaintiff v. Monsanto Company, et al., Defendant, United States District Court, Southern District of California, Case No. 3:15-cv-00578-WQH-AGS, July 1, 2019.

Ingrid Saizon Dardar versus ANCO Insulations, Inc., et al., Civil District Court for the Parish of Orleans, State of Louisiana, No. 2018-12646, May 29, 2019.

Clifton Thomas West and Mary Catherine West, Plaintiffs, v. Air & Liquid Systems Corporation, et al., Defendants, Jefferson Circuit Court, Louisville, KY, No. 18-CI-003669, May 23, 2019

Susan Rowland, et al., versus Union Carbide Corporation, et al., Civil District Court for the Parish of Orleans, Sate of Louisiana, Section 15, No. 18-8058, May 7, 2019.

David Glenn, Plaintiff vs. ABB, Inc., et al., defendants, In the Court of Common Pleas, County of Charleston, State of South Carolina, Civil Action No., 2017-CP-10-06270; Caleb Shane Tesmer, Plaintiff, vs. Borg Warner Corporation, et al., Defendants, Superior Court of New Jersey, Law Division: Middlesex County, Docket No: Mid-L-2555-18 AS, May 6, 2019.

William Phipps and Linda Phipps, Plaintiffs, v. Ajax Boiler & Heater Co., et al., Defendants, Superior Court of the State of California, County of Los Angeles, Case No. 18STCV02021, April 25, May 17, 2019.

Beatrice Bourque and Harris Bourque versus ANCO Insulations, Inc., et al., 19th Judicial District Court for the Parish of East Baton Rouge, State of Louisiana, No. C668093, March 14, 2019

Albert Lumpkins vs. ExxonMobil Corporation, Nineteenth Judicial District Court, Parish of East Baton Rouge, Louisiana, Docket No. 665850, March 12, 2019

Thomas R. Jones versus Air & Liquid Systems Corporation, et al., 14th Judicial District Court for the Parish of Calcasieu, State of Louisiana, No. 2018-1055, Feb. 28, 2019.

Ronald W. Dyer versus Avondale Industries, Inc, et al., Civil District Court for the Parish of Orleans, State of Louisiana, No. 2018-6835, February 26, 2019.

Air & Liquid Systems Corporation, Successor by Merger to Buffalo Pumps, Inc., et Al. Defendants, In the Superior Court of Whitfield County, State of Georgia, Civil Action No.:17ci01648, January 30, 2019.

Ronald Clark McMaster Versus Union Carbide Corporation, et al., 25th Judicial District Court for the Parish of Plaquemines, State of Louisiana, No. 64-393, Division: B, January 28, 2019.

In Re: Asbestos Personal Injury Litigation, In the Circuit Court of Kanawha County, West Virginia, Civil Action No. 03-C-9600, February 2019 Trial Group, January 24, 2019.

Carrol Hollingshead versus Eagle, Inc., el al., Orleans Parish Civil District Court State of Louisiana No. 2018-8339 Division "I-14", January 16, 2019.

Margaret J. Moore, Individually and as Executrix of the Estate of Billy Bob Moore, Deceased, and Lanny Moore Vs. Certainteed Corporation, et Al , Before the Asbestos MDL Pre-trial Judge, in the District Court of Harris County. Texas, 11th Judicial District, Cause No. 2015-37493-ASB, January 10, 2019.

Blinkinsop, et al. v. Albertsons Companies Inc., et al. LASC Case No. BC677764, Jan. 3, 2019.

Rita A. Cordes, Individually and as Executrix of the Estate of Robert Earl Hanker, Deceased, Plaintiff, v. Abb De, Inc., et al., Defendants. In the Court of Common Pleas, Cuyahoga County, Ohio, Case No.: CV-17-877760, Dec. 19, 2018.

Albert Berry, Jr., Plaintiff, versus The McCarty Corporation, et al., Defendants, 19th Judicial District Court for the Parish of East Baton Rouge, State of Louisiana, No. 653-022 , Oct. 29, 2018.

Jo Ann Startley, Individually and as Executor of the Estate of Ronnie A. Startley, Deceased, Plaintiff(s), vs. Welco Manufacturing Company, et al., Defendant, In the Circuit Court of Cook County, Illinois, Court No. 14 L 2716 in Re: Asbestos Litigation, October 16, 2018.

Janet Crow, et al., versus IMC Global Operations, Inc., et al., 19th Judicial Court for the Parish of East Baton Rouge, State of Louisiana, NO.: 667,462, October 16, 2018.

Sharon Daniels, Indiv. And as Special Admin. Of the estate of Patrick O'Reilly, Plaintiffs vs. Air & Liquid Systems Corporation, et al., Defendants, in the Circuit Court of Cook County, Illinois, County Department, law Division, No. 16-L-011308, September 12, 2018.

Laura Hummel, Chad Huff, Individually and as Surviving Heir of the Estate of ROGER HUFF, Deceased, Plaintiffs, vs. 4520 CORP., INC., Successor In Interest to Benjamin F. Shaw Company, et al. Defendants. In the Circuit Court State of Missouri Twenty-second Judicial Circuit Division, No. 22 (City of St. Louis), Cause No. 1722-CC10915, September 11, 2018.

Mary Lea Kennedy, Individually and as surviving Heir of the Estate of Robert Hare, Deceased, Plaintiff v. Advance Auto Parts, Inc., et al., Defendants, In the Circuit Court of the Twenty-Second Judicial Circuit, Case No. 1622-CC10186, Sept. 5, 2018.

Barbara J. Barr, Plaintiff vs. vs. A-1 Clutch Co., et al., Defendants, Suprerior Court of the State of California, County of Alameda, No. RG17880698, Sept. 4, 2018.

Louis Summerlin et al., v. Philip Morris USA et al., Massachusetts Superior Court C.A. No. 15-5255, August 28, 2018.

Betty Baxley, individually and as Personal Representative of the Estate of Malcolm M. Baxley, Plaintiffs, vs 3M Company, et al. Defendants. In the Superior Court of Richmond County, State of Georgia, Civil Action File No 2016RCCVS48, August 16, 2018.

Kevin Korte, as Personal Representative of the Wrongful Death Estate of Rodolfo Gutierrez, Deceased and Stella Gutierrez, Plaintiffs v. Burn Construction Company, Inc, et al., Defendants, State of New Mexico, County of Santa Fe, First Judicial District Court, No. D-101-CV-2017-01326, August 15, 2018

Mark Haness v. Albertson's LLC, et al Superior Court of the State of California, Los Angeles County, Case No. BC676287, August 14, 2018.

Joshua Haver, individually and as successor-in-interest to Lynne Haver, Deceased, Christopher Haver, Kyle Haver and Jennifer Morris, Individually v. BNSF Railway Company, et al; Superior Court of California; Los Angeles County, Case No. BC435551, August 13, 2018

Avina, et al. v. Amcord Inc., et al. LASC Case No.: JCCP 4674 / BC623250, July 16, 2018.

Laura Hummel, Chad Huff, Individually and as Surviving Heirs of the Estate of ROGER HUFF, Deceased, Plaintiffs, vs. Conwed Corporation, Individually and as Successor in Interest to Wood

Conversion Company, et al., Defendants. In the Circuit Court of the City of St. Louis State of Missouri Twenty-second Judicial Circuit, No: 1722-CC10915, June 26, 2018.

Bradd v. Air & Liquid Systems Corporation. et al. Alameda Superior Court Case No. RG17884478, June 19, 2018.

Ron M. Long, Sr. And Sheila Long, Plaintiffs, v. Borgwarner Morse Tec, Inc., et al., Defendants, in the Superior Court of Catoosa County, State of Georgia, Civil Action File No. SUCV 2016-001077, June 1, 2018.

Knutson v. Air & Liquid Systems Corporation, et al., Alameda County Superior Court Case No.: RG17886959, May 29, 2018.

Robert L. Richard, Plaintiff, vs. Dow Chemical Company, et al., Defendants, 18th Judicial District Court for the Parish of Iberville, state of Louisiana, No. 77,158, May 11, 2018

Nina Ghavami and Zia Ghavami v. BP America, Inc., et al., Los Angeles Superior Court, State of California, Case No. BC663990, April 2, 2018.

Kevin J. Westin, Individually and as Special Administrator for the Estate of Rebecca L. Westin, deceased, Plaintiffs, vs. Air & Liquid systems Corporation, et al., Defendants, In the Circuit Court, Third Judicial Circuit, Madison County, IL, Cause No. 16 L 854, March 27, 2018.

Donald & Donna Wigglesworth, Plaintiffs v. ABB, Inc., et al., Defendants, Los Angeles County Case No. BC 668162, March 26. 2018.

Joseph Thrash, et al., Plaintiffs, v. Cirrus Enterprises, LLC, et al., Defendants, United States District Court, Northern District of California, Case No. 3:17-cv-01501-JST, March 5, 2018

Thomas Eska, Administrator of the Estate of Mary Schiano, Deceased, Plaintiff, v. Consolidated Rail Corporation, et al., Defendants, In the United States District Court for the District of New Jersey, No.: 2:16-CV-00334-ES-SCM, March 2, 2018

Mata, et al. v. Air & Liquid Systems Corporation, et al., Los Angeles Superior Court, Case No. BC655564, Feb. 26, 2018.

Guy B. Fluck, III and Catherine Fluck v. Amcord, Inc., et al., Los Angeles Superior Court Case No.: BC667128, Feb. 21, 2018

Roy Standridge and Cynthia Standridge, Plaintiffs, v. Alfa Laval, Inc., et al., Defendants, United States District Court, Northern District of California, Case No.: 3:17-cv-03183-JD, Feb. 20, 2018.

Sherry Martin vs. Basco Drywall & Painting Co., et al. Alameda County Superior Court No. RG 1683279., Feb. 15, 2018.

Joseph Thomas, Individually and as Surviving Heir of the Estate of Donna Thomas, Deceased, Plaintiff, v. 84 LUMBER COMPANY, et al., Defendants, in the Circuit Court of the City of St. Louis, Twenty-second Judicial Circuit, State of Missouri, Cause No. 1622-CC10792, January 25, 2018.

Anniereen L. Gelpi versus Huntington Ingalls, Inc., et al., Civil District Court for the Parish of Orleans, State of Louisiana, Case No.: 2017-8859, January 19, 2018.

James William David and Lois Irene Davis, Plaintiffs, v. 3M Company, et al., Defendants, in the Circuit Court for Maury County, Tennessee at Columbia, Docket No. 15734, January 16, 2018.

Ronald Diaso, Sr., vs. CBS Corporation, et al., Los Angeles Superior Court, LASC Case No.: JCCP4674/BC661775, January 9, 2018.

Zoltan Horvath and Marion Schmidt vs. Basco Drywall & Painting Co., et al. | Alameda County Superior Court Case No. RG17863141. January 8, 2018.

PeggyLynn Wright versus PPG Industries, Inc., et al., Civil District court for the Parish of Orleans, State of Louisiana, No: 2017-01252, Dec. 11, 2017,

Sarah Krentz and Korey Krentz, Plaintiffs, v. 84f Lumber, et al., Defendants, in the Circuit Court, Twenty-Second Judicial Circuit, State of Missouri, Case No: 1622-CC01323, Dec. 8, 2017.

Jerry Craft versus Ports America Gulfport, Inc., et al., Civil District Court for the Parish of Orleans, State of Louisiana, No. 2017-06069, Dec. 6, 2017.

Maria Rosenfield, Individually and as special Administrator of the Estate of Max Rosenfield, Deceased, Plaintiff, vs. A.W. Chesterton Company, et al., Defendants. State of Illinois, In the Circuit Court of the Third Judicial Circuit, Madison County, Case No. 15-L-1729, Dec. 4, 2017.

William Aby, et al. v. Allied Packing & Supply, Inc., et al. Alameda Superior Court Case Number RG17867066. Nov. 6, 2017

Barbara Wittman et al. v. Brenntag North America, Inc. et al., Case No. JCCP 4674 / BC646439, filed in the Superior Court of the State of California for the County of Los Angeles, Nov. 3, 2017.

Charles L. Brown, Sr., and Teresa A. Brown v. Air & Liquid Systems Corporation, et al.; in the Circuit Court of Newport News, VA, Case No: CL1600132M-05, October 24, 2017.

Sharron Smith et al. vs. Chevron Phillips Chemical Company LP, et al., County of Los Angeles, Case No.: BC658052, October 12, 2017.

Julia Goo, Plaintiff v. Arcon, Inc., et al., Defendants, Alameda County, CA, Case no. RG17855987, October 10, 2017.

Wesley Quisenberry, Personal Representative of the Estate of Wanda J. Quisenberry, deceased, Plaintiff v. Borgwarner Morse Tec Inc., et al, Defendant, In the United States District Court for the Eastern District of Virginia, Newport News Division, C.A. No. 4:16-cv-00126-AWA-RJK, October 4, 2017.

John Serrano and Rachel Serrano v. All American Home Center, Inc., et al.
Alameda Superior Court Case No. RG17856432; 2) Wendell L. Sells, Sr., Individually and as Successor-in-Interest to Decedent Curtis E. Sells, Sr., et al. v. BASF Catalyst, LLC., et al.
Alameda Superior Court Case No. RG15755480, October 3, 2017

Katherine M. Uyeno, Plaintiff vs. The Old Oahu Tug Service, Inc., et al., In the Circuit Court of the First Circuit, State of Hawaii, Civil No. 16-1-2006-10, September 26, 2017.

Darrell Lee Nichols, Plaintiff, v. Bucyrun International, Inc., f/k/a Bucyrus Erie, et al., Defendants, In the Circuit Court of the Seventeenth Judicial Circuit of the State of Florida, in and for Broward Count, Civil Division, Case No.: 16-014587, September 19, 2017.

Ronald Seals v. Air & Liquid Systems Corporation, Alameda County, California, Case No.: RG7854523, September 18, 2017

D. Maria Schmidt, as Personal Representative for the Estate of Donald August Guarienti, Deceased, et al., Plaintiffs, v. Bradbury Stamm Construction, inc, et al., Defendants, State of New Mexico, county of Santa Fe, First Judicial District, No. D-101-CV-2016-00479, September 14, 2017.

John J. Jasmin, Sr. versus Huntington Ingalls, Incorporated, et al., 23rd Judicial District Court for the Parish of St. James, State of Louisiana, No. 37877 Section Division, September 6, 2017.

William D. Coleman versus Anco Insulations, Inc. et al., in the United States District Court for the Middle District of Louisiana, Case No. 3:15-CV-00821, August 30, 2017.

Michael Mandel, an Individual; Amy Mandel, an Individual, Plaintiff, v. American International Industries Inc.; Benntag North America, Inc. and DOES 1 through 400, inclusive; Case Name: LAOSD Asbestos Cases, July 6, 2017.

Amy Elizabeth Voltaire, Executor of the Estate of George F. Voltaire, Deceased v. John Crane, Inc., et al.; Civil Action No. CL11-01322P-03 (DP); Agnes Mary Keller Versus Mosaic Global Holdings, Inc., et al. 23rd Judicial District Court for the Parish of St. James, State of Louisiana, Number 37,676, Division "B" June 26, 2017

Ronald Smith versus Georgia Pacific, LLC, et al., Civil District Court for the Parish of Orleans, State of Louisiana, No. 2016-8110, June 6, 2017

Linda Gibbons, et al., Petitioners, vs. A.W. Chesterton Company, et al., Circuit Court for the City of St. Louis, Twenty-Second Judicial Circuit, State of Missouri, Cause No.: 1622-CC02597, May 25, 2017.

Glenn Burton, Jr., Plaintiff vs. American Cyanamid Co., et al., United States District Court, Eastern District of Wisconsin, Milwaukee Division, Case No. 07-CV-000303, May 12, June 12, July 14, 2017.

Frank Hart and Cynthia Hart v. Calaveras Asbestos, Ltd., et al., Alameda Superior Court Case No. RG16838191, May 10, 2017.

Elizabeth Ann Comer, Petitioner, vs. CBC Corporation, etc., et al., Defendants, In the Circuit Court of Jasper County, Missouri, Cause No. 16AO-CC00095, May 2, 2017.

Curtis D. Morgan vs. Dow Chemical Company, et al., Docket No. 076625, 18th Judicial District Court for the Parish of Iberville, Division “B,” April 18, 2017

Janet Shaw, et al., Plaintiffs v. Amcord, Inc., et al., Defendants, In the Alameda Superior Court, Case Number RG15771646, April 17, 2017.

Paul M. Cornett, et al., Plaintiffs, v. Clark Industrial Insulation Co., et al., Defendants, In the Court of Common Pleas, Cuyahoga County, Ohio, Case No. CV-15-845107, April 3, 2017.

Arlin Anderson v. Air & Liquid Systems Corporation et al., Los Angeles County Courthouse, Case No: BC635249, March 21, 2017.

Earl T. Lindsay, Jr., et al., versus Ports America Gulfport, Inc., et al., Civil District Court for the Parish of Orleans, State of Louisiana, No. 2016-1610, March 7, 2017.

Eugene and Elodie Paroni vs. Allied Fluid Products Corp. FKA Allied Packing & Supply, Inc. Alameda County Superior Court, Case No. RG16818904, February 27, 2017.

John Ballard and Suzanne Ballard, Plaintiffs, vs. 3M Company, Defendants, Superior Court of the State of California, County of Alameda – Court of Unlimited Jurisdiction, Case No.: RG16827972, February 17, 2017.

Allen Chin versus Reilly-Benton Company, et al., Civil District Court for the Parish of Orleans, State of Louisiana, No. 2016-4669, February 16, 2017.

Godfrey T. Fagot versus Dow Chemical Company, et al., 18th Judicial District for the Parish of Iberville, State of Louisiana, No. 076,092, February 14, 2017

Jenny Giltner, et al. v. AKH Company, et al. Alameda Superior Court Case No. RG15766720, January 10, 2017

Nelda Muscarello et al., versus Eagle, Inc., et al., 19th Judicial District Court for the Parish of East Baton Rouge, No. 644-766; Leslie McGrew versus Ethyl Corporation, et al., 18th Judicial District Court for the Parish of Iberville, No. 75,929, January 9, 2017, March 27, 2017

Usia Lyons, Jr., et al., versus Anco Insulations, et al., Civil District Court of New Orleans, No:

2015-10236, January 5, 2017.

Edna Garcia and estate of Robert Garcia, Sr., Deceased, Plaintiffs vs. Exxon Mobil Corporation, et al., Defendants, in the District Court of Harris County, TX, 11th Judicial District, Cause No. 2016-44392-ASB, November 29, 2016.

Krystal Beal v. BorgWarner Morse Tec, Inc., et al., Alameda Superior Court Case No. RG16820986, November 15, 2016.

Glenn Templet, Sr. versus Huntington Ingalls, Inc., et al., Civil District Court for the Parish of Orleans, State of Louisiana, Section 10, No: 2016-1877, November 1, 2016.

Donald Moody v. Allied Packing & Supply, Inc., et al., Alameda Superior Court Case No. RG16805727, October 14, 2016.

Paul Horton and Patricia Horton v. American Biltrite, Inc., et al., Alameda Superior Court Case, California, No. RG16809189, October 12, 2016

William Ford Jr. and Carrie Mae Ford v. Georgia Pacific LLC, et al, Court of Common Pleas, Cuyahoga County, Ohio, Case No. CV-14-830574, October 3, 2016.

Julius David Bourke versus Exxon Mobil Corporation, et al., Civil District Court for the Parish of Orleans, State of Louisiana, Section I-14, No. 2015-8136, September 28, 2016.

Judith Rhodes vs. Berglund Family Vineyards, et al., San Francisco County Superior Court No. CGC-16-276497, September 22, 2016.

Royce Reid and Paula Reid vs. Certainteed Corporation, et al., Before the Asbestos MDL Pre-Trial Judge, in the District Court, Harris County, Texas, 11th judicial District, Cause No. 2016-18802, September 20, 2016

Anna Blount v. Colgate-Palmolive Co., et al. Los Angeles SC Case No. BC617806, September 12, 2016

Jose Trigueros Versus Boland Marine & Manufacturing Company, LLC, et al., Civil District Court for the Parish of Orleans, No. 16-559, Division J-5, August 31, 2016.

San Juana Sandoval and Rodolfo Sandoval v. American Water Heater, et al., Los Angeles Superior Court No. BC592765, August 30, 2016.

Peggy Rhoades, Executrix of the Estate of Marsha A. Newman, Deceased, Plaintiff, vs. American Optical Corporation, et al., defendants, In the court of Common Please, Cuyahoga County, Ohio, Case No., 818709, August 18, 2016.

Beth Harris et al. v. Allied Packing & Supply, Inc. et al. Alameda Superior Ct. case No. RG-14-725868, August 17, 2016.

Jesus Payan and Francisca Payan vs. CBS Corporation, et al. Los Angeles Superior Court Case No. BC608412/JCCP 4674, August 15, 2016.

Edwin Spirer, et al., Plaintiffs, v. Monsanto Company, et al., Defendants, Missouri Circuit Court, Twenty-First Judicial Circuit, St Louis County, Case No. 12SL-CC01263, August 8, 2016.

Louis Lowell and Anne Marie Lowell, Plaintiffs, vs. ABB Inc., et al., Defendants, Superior Court for the State of California, for the City of Los Angeles, Case No. BC 602346, July 25, 2016.

Richard LeBlanc, Jr. and Patricia LeBlanc, versus BP America, et al., 18th Judicial District Court for the Parish of Iberville, State of Louisiana, Docket No. 73,666, July 20, 2016

Ernest H. Lieseke et al., Plaintiffs, v. Asbestos Corporation LTD, et al., Defendants, Superior Court of the State of Washington for King County, No. 13-2-37242-8 SEA, July 5, 2016

Peter J. Lamonica and Exine Lamonica, Plaintiffs, v. Colgate-Palmolive Company (Sued Individually and as Successor-in-interest to Mennen Company), et al, Defendants, Superior Court of the State of California, County of Los Angeles, Case No. BC604809, June 17, 2016.

Lee Mize and Pat Mize, Plaintiffs, v. 84 Lumber Company, et al., Defendants, Superior Court of the State of California, County of Sacramento, Case No. 34-2013-00153135, May 24, 2016.

Marta L. Poling-Goldenne, et al., vs. Amcord, Inc., et al., Los Angeles Superior Court Case No. BC553948, May 16, 2016

Joseph David Weis, III, Versus DSM Copolymer, Inc., et al., 19th Judicial District Court for the Parish of East Baton Rouge, State of Louisiana, No. 640487 Division D, May 9, 2016

Benito Walker, et al., Plaintiffs, v. Monsanto Company, et al., Defendant, Missouri Circuit Court, Twenty-Second Judicial Circuit, St. Louis City, Cause No. 1122-CC09621-01, April 24, 2016.

Vera Bernstein and Joel Bernstein, Plaintiffs, against R.J. Reynolds Tobacco Company, et al., defendants, United States District Court, souther District of New York, Docket No.: 1:15-CV-5301, April 21, 2016.

Robert Karstetter and Velma Bigington, Plaintiffs, vs. Parsons Government Services, Inc., et al., Defendants, Superior Court of New Jersey, Law Division – Middlesex County Asbestos Litigation, Docket No.: MID-L-3187-15 AS, April 20, 2016.

Sharon North v. American Biltrite, Inc., et al., Alameda Superior Court Case Number RG15795680, April19, 2016. (Telephone)

Nancy Easling v. Certainteed Corporation, et al., Superior Court of the State of California, For the County of Alameda Case No. RG 12634694, April 5, 2016

Rodney E. Rodgers and Mary Ellen Rodgers, Plaintiffs, v. Air & Liquid Systems Corporation, et al., Defendants, In the Circuit Court for the City of Portsmouth, Virginia, Case No.: CL15-000384-00, March 30, 2016.

Jimmy D. Tracy and Lynda Tracy, Plaintiffs vs. Asbestos Corporation Limited, et al., Defendants, In the Superior Court of Floyd County, Georgia, Civil Action File No.: 15-CV-01000 JFL 002, March 21, 2016.

Willmer Pelton and Wanda Pelton, Plaintiffs vs. Air and Liquid Systems Corporations, et al., Defendants, In the Circuit Court, State of Missouri, Twenty-Second judicial Circuit, Cause No. 1522-CC09851, March 7, 2016.

Stephen Mead, et al. v. Amcord, Inc., et al., Los Angeles Superior Court Case No. BC593270, March 2, 2016.

Roslyn Dauber and John Di Costanzo, Plaintiffs, vs. Monsanto Company, et al., Defendants, Superior Court of the State of California, for the County of Los Angeles, Case No. BC483342, February 22, 2016.

In Re: Asbestos Personal Injury Litigation February 2016 Trial Group, in the Circuit Court of Kanawha County, West Virginia, Civil Action No. 03-C-9600, February 17, 2016.

Lemberger et al. v. Allied Packing, et al., Alameda Superior Court Case No. RG14717788; Yanez v. 3M Company, f/k/a Minnesota Mining and Manufacturing Company, et al., Los Angeles Superior Court Case No. BC590054, February 2, 2016. (Telephone)

Harris v. Milliken & Co., State Court of Athens-Clarke County, State of Georgia, Civil Action File No. ST14CV0025, January 29, 2016.

Vernon Aman and Diana Aman, Plaintiffs, vs. Certainteed Corporation, et al., Defendants, in the Superior Court of the state of California, For the County of San Joaquin, Case No. 39-2015-00327476-CU-PO-STK, January 20, 2016. (Telephone)

Thomas Mazur, Individually and as Special Administrator of the Estate of Don Mazur, deceased, and Antoinette Mazur, Plaintiffs, v. A.w. Chesterton, Inc., et. al Defendants, In the Circuit Court of Cook County, Ill County Department, Law Division, Case No. 2015-L-002639, Jan.7, 2016.

Edwin Spirer, Plaintiff v. Monsanto Company, et al., Defendants, Missouri Circuit Court, Twenty-First Judicial Circuit, St. Louis County, Case No. 12SL-CC01263, December 17, 2015.

Ralph Delmonico and Donna Delmonico, Plaintiffs, v. A.O. Smith Company, et al., Defendants, State of Rhode Island, Providence, SC, In re: Asbestos Litigation, Civil Action No., 14-2901, October 5, 2015.

Barbara Seiber, Individually and as Personal Representative of the heirs and Estate of Brentley Seiber, Deceased, Plaintiffs, vs. 4520 Corporation, Inc, et al, Defendants, In the District Court of

Harris County, Texas, 11th Judicial District, Cause No. 2012-14503 – ASB, September 20, 2015

Paul Heaton, Administrator for the Estate of Robert Brawley, et al., Plaintiff v. Ford Motor Company, et al., Defendants, In the Court of Common Pleas, Cuyahoga County, Ohio, Case No. 759955, September 8, 2015

Anna L. Grimsley v. 4520 Corporation, individually and as successor-in-interest to Fred J. Early Jr. Company, Inc., et al., Alameda Superior Court Case No. RG15755791, August 26, 2015, (telephone)

Roger R. Kangas and Catherine Kangas, Plaintiffs, vs. American International Industries, et al., Defendants, Superior Court of the State of California for the County of Los Angeles, Case. No. BC570125, August 20, 2015 (telephone)

Raffaele Bellopede and Gloria Trejo v. Amcord, Inc., et al. | Los Angeles County Superior Court Case No. BC 557475, August 12, 2015 (telephone)

Stewart E. Poore and Sheryl D. Poore, Plaintiffs vs. Pneumo Abex, LLC, et al., Defendants, in the Circuit Court of the fourth Judicial Circuit in and for Duval County, Florida, Case No.: 16-2014-CA-007519, August 11, 2015; September 1, 2015.

Tommy D. Tate, Sr. and Aldoria Lagura Tate v. Amcord, Inc., et al., Los Angeles County Superior Court Case No. BC 560185, August 10, 2015 (telephone)

Martha Dixon, Individually and as Personal Representative of the Estate of Lloyd Dixon, Deceased, Plaintiff vs. Air Products and Chemicals, Inc., et al., Circuit Court of the State of Missouri, Twenty-Second Judicial Circuit, No. 1422-CC00219, July 21, 2015.

Lawrence Graubart v. American Cyanamid Company, et al. San Francisco Superior Court Case No. CGC-14-276371, July 8, 2015 (telephone).

Gail A. Robinson, individually and as Personal Representative of the Estate of William J. Robinson, et al., Plaintiff v. Air & Liquid Systems Corporation, as successor by merger to Buffalo Pumps, Inc., et al., United States District Court for the District of Wyoming, Case No.: 2:14cv-00161 ABJ, June 22, 2015.

Larry R. Cardinale and Pamela M. Cardinale v. Allied Packing & Supply, Inc., et al., Alameda County Superior Court Case No. RG 14 749122, June 18, 2015, (telephone).

Richard Gooding, as Personal representative of the Estate of Goldie Gooding, deceased, Plaintiffs v. A.W. Chesterton Company, et al., defendants, in the Superior Court of the State of Washington, County of Pierce, Cause No., 13-2-14602-4, June 4, 2015 (telephone).

In Re: Asbestos Personal Injury Litigation June 2015 Trial Group, in the Circuit Court of Kanawha County, West Virginia, Civil Action No. 03-C-9600, May12, 2015.

Jennifer Ridenour, et al. v. 3M Company, et al. Tulare County, California, Superior Court Case No. VCU253652., April 16, 2015 (telephone).

Jean Smith and Nelson Smith, Plaintiffs v. Arvinmeritor, Inc., et al., Defendants In the Circuit Court, State of Missouri, Twenty-Second Judicial Circuit, Cause No. 1422-CC08996, Asbestos Division, April 14, 2015.

Richard A. Bugg, Jr. and Cynthia Bugg, Plaintiffs, v. A.W. Chesterton Co., et al., Defendants, Commonwealth of Massachusetts Middlesex, Co. Superior Court, Department of the Trial Court, Civil Action No. 14-6323, March 18, 2015 (telephone).

Charles D. Castleberry, Individually and as Special Administrator of the Estate of Marilyn E. Castleberry, deceased, Plaintiff, - against - Arvinmeritor, Inc., et al., Defendants, Case No.: 12-1-1938 in the Circuit Court, Third Judicial Circuit Madison County, Illinois, February 18, 23, 2015.

Ernie P. Maia vs. Arvinmeritor, Inc. Et al., C/A No.: RG14735552, in California, February 12, 2015, (telephone)

James Hall v. Cooper T. Smith, et al, Civil District Court for the Parish of Orleans, State of Louisiana, Case No. 2014-5780, February 10, 2015.

Mary Planer, et al., Plaintiff vs. A.W. Chesterton Company, et al., Defendants, Case No. 1322-CC09233, pending in the Circuit Court, State of Missouri, Twenty-Second Judicial Circuit (City of St. Louis, January 23, 2015 (telephone).

Donald Keith Anders and Marion Anders v. American Biltrite Inc., et al., Case No. CGC-14-276287, pending in the Superior Court for the County of San Francisco, January 16, 2015

Leslie Hearon, et al., Plaintiff, v. Monsanto Company, et al., Defendants. Cause No.: 12SL-CC-01497, Div. 16 Missouri Circuit Court, Twenty-first Judicial Circuit, St. Louis County, December 22, 2014.

Carlos S. Tarazon, et al., v. Certainteed Corporation, et al., Maricopa County Superior Court Case No. CV2013-001762, December 19, 2014 (telephone).

John New and Beth New, Plaintiffs, v. Caterpillar Inc., *et al.*, Defendants. In the United States District Court For the Western District of Missouri, Western Division , No. 4:13-cv-00675-DKG, December 17, 2014.

Barbara Lee-Ayers v. Avondale Industries Inc. et al. , Orleans Parish, Louisiana, November 7, 2014.

Jones v. Calaveras Asbestos and Certainteed Corporation, LA Superior Court Case No. BC541164, November 5, 2014.

Richard Hill, et al., Plaintiffs vs. ACandS, INC, et al., Defendants, In Re: Personal Injury Asbestos Litigation, In the Circuit Court for Baltimore City, Case No. 24x13000462, October 30, 2014 (telephone).

Gary and Becky Knapp vs. Asbestos Corp. Ltd., et al. (LASC BC 523177), October 17, 2014 (telephone)

Cloristeen Collins, et al v. RPI Company, Alameda County Superior Court, Case No. RG04143303, October 15, 2014 (telephone)

Patricia A. Terrell and Barbara A. Appleford, Individually and as Executors of the Estate of SUSAN NESTER, Plaintiffs, v. 3M COMPANY (f/k/a Minnesota Mining & Manufacturing Co.), et al., Defendants, In the Superior Court of the State of Delaware, In and for New Castle County, In Re: Asbestos Litigation, C.A. No. : 12C-08-288, October 14, 2014.

Jeffrey S. Artz, Successor Executor of the Estate of Robert P. Artz, Dec'd, Plaintiff v. A. W. Chesterton Company, et al., Defendants, In the Court of Common Please, Cuyahoga County, Ohio, Case No. 779154, October 9, 2014 (telephone)

Arthur and Marcia Law v. Asbestos Corp., Ltd., et al. Alameda County Superior Court No.: RG14721226, October 8, 2014 (telephone)

Jeffrey Scott Pickard and Susan Pickard, Plaintiffs, vs. 3M Company, Et al., In the Circuit Court of the City of St. Louis, Twenty-Second judicial Circuit, State of Missouri, Cause No.: 1322-CC01066, October 2, 2014.

In Re: Personal Injury Asbestos Litigation October 2014 Trial Group, In the Circuit Court of Kanawha County, West Virginia, September 23, 2014.

Robert Tis v. A.W. Chesterton Co., et al., Massachusetts Superior Court C.A., No. 13-3653, September 11, 2014.

Dennis Witsoe, et al., v. Ajax Electric Co., et al., Docket # ASB-FBT-CV-12-5029712-S, Superior Court of Fairfield at Bridgeport (Connecticut), September 10, 2014.

Michael E. Williams, et al., Plaintiffs vs. Monsanto Company, et al., Defendants, Case No. BC461315, Superior Court of the State of California for the County of Los Angeles, August 15, 2014.

Martin Truman Mitchell, Jr., Plaintiff v. Alcatel-Lucent USA, Inc., et al., Defendants, Cause No. 1322-CC00922 In the Circuit Court, State of Missouri, Twenty-Second Judicial Circuit, July 20, 2014.

Clyde Knudsen, Individually and as Personal Representative of the Estate of Donald D. Knudsen, Plaintiff, v. Alcatel-Lucent USA, Inc., et al., Defendants, Case No. 2013-CP-10-4161, State of South Carolina, County of Charleston, In the court of Common Pleas, Ninth Judicial

Circuit, July 29, 2014.

Erin Stephens, Individually and as Personal Representative of the heirs and Estate of Charles M. Stephens, Plaintiff v. Hobart Brothers Company and The Lincoln Electric Company, defendants, No. 13-2-10748-7, in the Superior Court of the State of Washington in and for the County of Pierce, July 22, 2014.

Jody Studer, Individually and on behalf of the Estate of Ronald J. Studer, Plaintiffs, v. American Standard, Inc., et al., Defendants, Case No. CV 11-752415, In the Court of Common Pleas, for Cuyohoga County, Ohio, July 16, 2014.

Melanie Guillory vs. Anco Insulations, Inc., et al., 19th Judicial District Court for the Parish of East Baton Rouge, State of Louisiana, C.A. No. 623759, July 8, 2014

Tammie D. Soucy, Plaintiff v. Briggs & Stratton Corporation, et al., Defendants, Civil Docket No. 1:12-cv-00068-NT, United States District Court, District of Maine, July 1, 2014.

Helen Hammonds, individually and as survivor of Decedent William Hammonds, Plaintiff v. Monsanto Company, et al., in the Missouri Circuit Court, Twenty First Judicial Circuit, St. Louis County, Cause No. 10SL-CC03437, June 4, 2014.

Joseph E. Anderson and Marilyn E. Anderson, Plaintiffs v. 3 M Company, et al., Defendants, No. 13-2-14901-5, Superior Court of the State of Washington for Pierce County, May 30, 2014, (by telephone).

June 2014 West Virginia Trial Group, In the Circuit Court of Kanawha County, West Virginia, May 27, 2014

GERALD HOWARD GOLDMAN, Individually and as Successor-in-Interest to ELIZABETH ANN GOLDMAN, Decedent;, et al, Plaintiffs, v. AC AND S, INC., et al., Defendants., Case No.: RG11579926, SUPERIOR COURT OF THE STATE OF CALIFORNIA, COUNTY OF ALAMEDA - COURT OF UNLIMITED JURISDICTION, Telephone, May 7, 2014

Rita Michelle Miller, Individually and as Executor of the Estate of Donald Bowles v. CSX Transportation, Inc., et al. Civil Action No.: 08-C-9700, West Virginia FELA Asbestos Mass Litigation Panel, Circuit Court of Kan. Co., West Virginia; and Marilyn Paschal, Plaintiff, vs. Ill. Central RR Co., Defendants, Civil Action No. 11-CI-00183, Commonwealth of Kentucky, McCracken Circuit Court, April 29, 2014; May 5, 2014

Beverly T. MacLeod, Individually and as Executor of the Estate of William B. MacLeod, Deceased v. John Crane Inc., et al.; Case No. CL13-01657F-15, In the Circuit Court for the City of Newport News, Virginia, April 2, 2014.

Estate of Eric Sparks v. A.W. Chesterton Co., et al. Massachusetts Superior Court, C.A., No. 13-1053, March 4, 2014

Daniel v. John Crane, et al, Virginia, December 17, 2013.

Michael Vogel, Jr., Individually and as Special Administrator of the Estate of Carl G. Vogel, Deceased, Plaintiff, vs.. Afton Chemical Corporation, et al., Defendants, In the Circuit Court Third Judicial Circuit, Madison County, Illinois, No., 2010-L-001175 and Maria Gadberry, Individually and as Special Administrator of the Estate of Billie Gadberry, Deceased, Plaintiff v. A.W. Chesterton, Inc., et al., October 30, 2013.

Ryan Sowders, Representative of the Heirs and Estate of Nola Yates, Deceased, Plaintiff, v. A.W. Chesterton, Inc., et al., Defendants, In the Circuit Court Third Judicial Circuit, Madison County, Illinois, Cause No. 11-L-623, October 16, 2013.

Luther Beverage, et al., October 8, 2013 Mesothelioma Trail Group, Plaintiffs Consolidated Case No. 24x1 1000785 V. ACand S, Inc., et al., Defendants, In Re: Baltimore City in the Asbestos Litigation Circuit Court for Baltimore City, September 13, 2013.

Cynthia Morrone and Eugene Morrone, H/W, Plaintiffs v. American Biltwrite, Inc., et al., Defendants, Docket No. L-1417-12 AS Superior Court of New Jersey, Law Division: Middlesex County, August 29, 2013.

Donald Noll and Candance Noll, Plaintiffs v. American Biltrite Inc., et al., No. 13-2-06781-1 SEA, Superior Court of Washington for King County, August 28, 2013.

Robert Stamps Versus Asbestos Corporation Limited, et al, No.: 695-709, Division "N," 24th Judicial District Court for the Parish of Jefferson, State of Louisiana, August 21, 2013, (by telephone)

Michael Vogel, Jr. ... Plaintiff, vs. Afton Chemical Corporation, et al., Defendants, No. 2010-L-001175 in the Circuit Court, Third Judicial Circuit, Madison County, IL, July 8, 2013.

Leo White and Eleanor White, Plaintiffs, v. Allied Signal Inc., N/K/A Honeywell International Inc., et al., Defendants, Civil Action No. 12-3335, State of Rhode Island, Providence, RI, June 25, 2013.

Robert G. Carlton and Helen c. Carlton, Plaintiffs, v. Waco, Inc, Defendants, In the Circuit Court for the City of Newport News, Virginia, Case No.: CL10-01540P-03 (DP), June 13, 2013.

John Keiser & Anne Keiser, Plaintiffs, et al., vs. A. W. Chesterton Company, et al., Defendants, Missouri Circuit Court, Twenty-Second Judicial Circuit, City of St. Louis, Case No. 1222-CC00328 and Gary Braun, et al., Plaintiffs v. A. W. Chesterton Company, et al., Defendants, in the Circuit Court, Third Judicial Circuit, Madison County, IL, Case No. 12-L-573, May 23, 2013.

Gloria Dobson, as Administrator of the Estate of Bert L. Dobson, deceased, et al., Plaintiffs, vs. Caterpillar Inc., Defendant, Missouri Circuit Court, Twenty-Second Judicial Circuit, City of St. Louis, Cause No. 1222-CC00841, March 19, 2013.

Arlene Graybill, et al., Plaintiffs v. A.W. Chesterton Company, et al., Defendants, Missouri Circuit Court, Twenty-Second Judicial Circuit, City of St. Louis, Cause No. 1022-CC10506, March 12, 2013.

Alan J. Hantak and Patricia Hantak, Plaintiff v. ABB, Inc. D/b/a ABB DE INC., et al, In the Circuit Court of the 11th Judicial Circuit in and for Miami-Dade County, Florida, Asbestos Litigation, Case No.: 12-15235 CA 42, January 23, 2013.

In Re: Asbestos Personal Injury Litigation, Mass Litigation Panel, In the Circuit Court of Kanawha County, West Virginia, Civil Action No.: 03-C-9600 KAN, January 18, 2013.

The People of the State of California v. Atlantic Richfield, et. al, Superior Court of California, Santa Clara County, Case Number 1-0-CV- 788657, October 18,19, 22, 2012.

Gaylord Poffenbaugh and Gusta M. Poffenbaugh, Plaintiffs, v. Borg-Warner Corporation, et al., Defendants, In the Circuit court of the City of St. Louis, State of Missouri, Cause No. 1122-CC10659, Division 1, October 4, 2012

Raymond Smith and Rosie Smith, Plaintiffs, vs. BNSF Railway Company, et al., Defendants. In the Superior Court of the State of California, in and for the County of Alameda, No. RG12623812, September 27, 2012

Rueben Morgan, Plaintiff vs. Bill Vann Company, Inc., et al., Defendants, In the United States District Court for the Southern District of Alabama, Northern Division, Case No. 2:11-CV-0535-B, September 25, 2012

In Re: Asbestos Litigation, in the Circuit Court for the 17th Judicial Circuit, Broward County, Florida, Case No. CACE 92-90000, September 7, 2012

Chelsea Wren, et al., Plaintiffs v. Fluor Corp., et al., Defendants, Missouri Circuit Court, Twenty Second Judicial Circuit, Cause No., 052-10613, Division Twelve, August 29, 2012.

Marcia Mauldin et al. v. Georgia-Pacific LLC, et al., Superior Court of Towns County, State of Georgia, Civil Action File No. 10-CV-351-08, July 8, 2012

Nick Dennis, Jr. and Sandra Dennis v. A.W. Chesterton, Inc., et al., In the Circuit Court Third Judicial Circuit, Madison County, IL, Court No.: 2012L 000001, In Re: Asbestos Litigation, June 27, 2012.

George J. Adams v. Oakfabco, Inc., f/k/a Kewanee Boiler Corporation, et al
Madison County, Illinois B Cause No. 11-L-1038, February 23, 2012

In Re: New York State Asbestos Litigation,@ Supreme Court: All Counties within the State of New York, New York, NY, February 27 and 29, 2012, June 25, 2012

YASMINE CLARK, Minor, by her guardian ad litem, SUSAN M.. GRAMLING, Plaintiff, vs AMERICAN CYANAMID COMPANY, et al., Defendants CASE NO. 06-CV-012653, Circuit Court, Milwaukee County, State of Wisconsin, deposition May 17, 2010

Ruth Nishida, et. Al., v. Monsanto and Solutia, Cause # 09SL-CC01964, Missouri Circuit court, Twenty-First Judicial Circuit, St. Louis County, Nov. 18, 2010; and May 22, 2012.

Alternate Dispute Resolution Case

March 5, 6, 9 - 10, 2015, Private ADR Proceeding, Confidential.

March 11-12, 2015, Private ADR Proceeding, Confidential.

April 8-10, 2015, Private ADR Proceeding, Confidential